ASSESSMENT OF URBAN MOBILITY: **ULAANBAATAR**

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CONTENTS

01.

PURPOSE & METHODOLGY

- Objective of the Study
- Methodology

1.1. OBJECTIVES OF THE STUDY

The objective of this study is to develop a Sustainable Urban Transportation Index (SUTI) for Ulaanbaatar, Mongolia

1.2. UNESCAP METHODOLGY

- This index was developed by United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) to measure, compare and evaluate the performance of sustainable urban transport and related sustainable development goals of Asian cities.
- Sustainable Urban Transport Index (SUTI) is a framework of indicators for the assessment of urban transport systems and services in a city.
- The 10 indicators specified in the SUTI will evaluate the transportation system in Ulaanbaatar and the results will be depicted in the spider diagram.
- Results will help in identifying the fields of improvement from the existing

02.

ASSESSMENT OF SUTI IN ULAANBAATAR

1) Extent to which transport plans cover public transport, intermodal facilities, and infrastructure for active modes
2) Model share of active and public transport in commuting
3) Convenient access to public transport services
4) Public transport quality and reliability
5) Traffic fatalities per 100000 inhabitants
6) Affordability – travel costs as a share of income
7) Operational costs of the public transport system
8) Investment in the public transportation system
9) Air Quality (pm10)
10) Greenhouse gas emissions (CO_2 eq tons/year)

SUT 01I

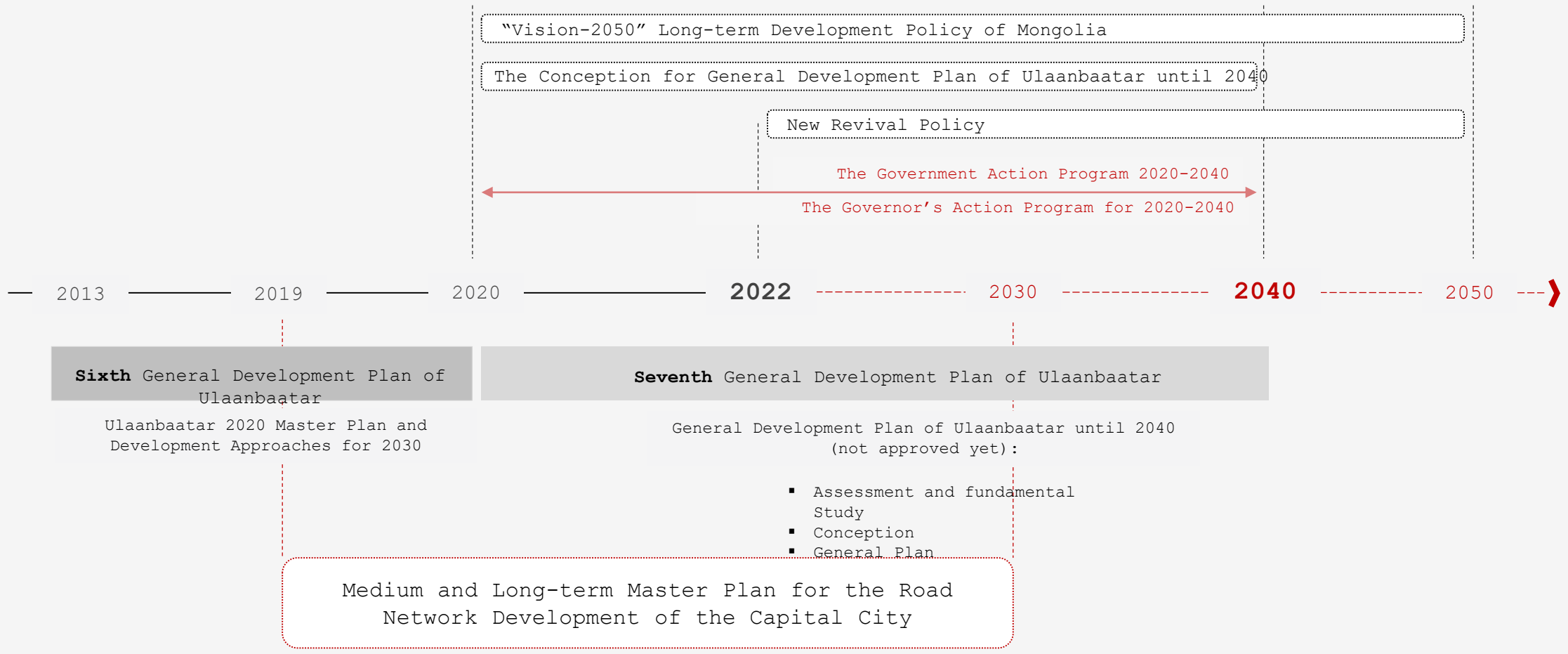
EXTENT TO WHICH TRANSPORT PLANS COVER PUBLIC TRANSPORT, INTERMODAL FACILITIES, AND INFRASTRUCTURE FOR ACTIVE MODES

Assessment Of Urban Mobility: Ulaanbaatar

SCORE: 0-16

1. Walking networks
2. Cycling networks
3. Intermodal transfer facilities
4. Expansion of public transport modes by adopting low emission vehicles

1.1. IMPLEMENTING POLICY DOCUMENTS/ TIMELINE

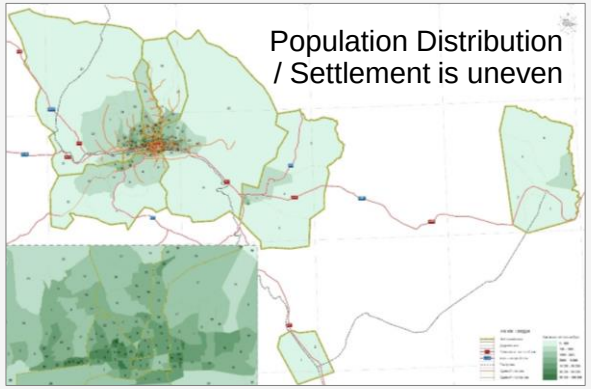


1.1. GENERAL DEVELOPMENT PLAN OF ULAANBAATAR UNTIL 2040

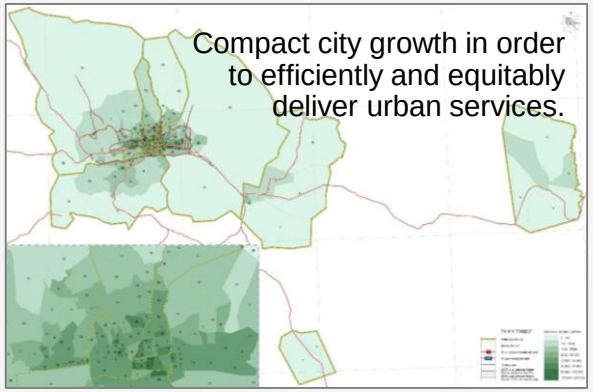
Current

2030

POPULATION

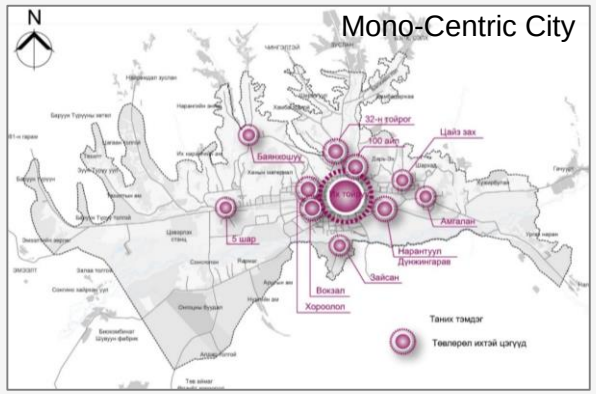


	Population /mln people/	Area /1000 ha/	Population Density /Pop/km²/
UB Region	1.41	470	2.91
UB	1.26	35.602	36.2

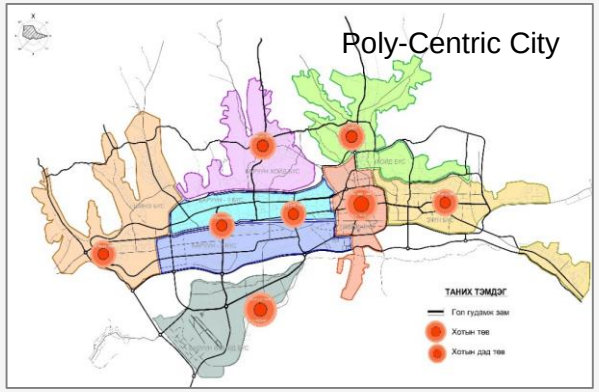


Population: 1.7 million

URBAN CONCENTRATION

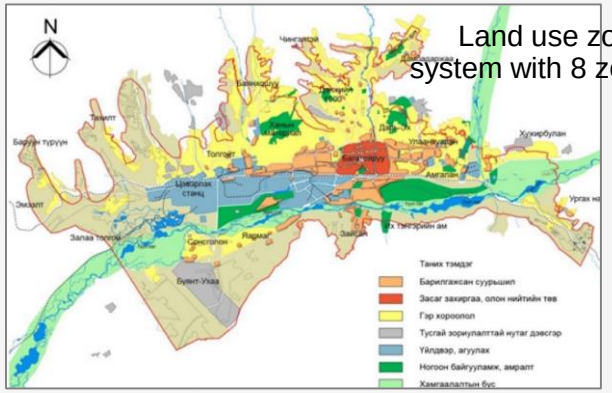


Main center: 1

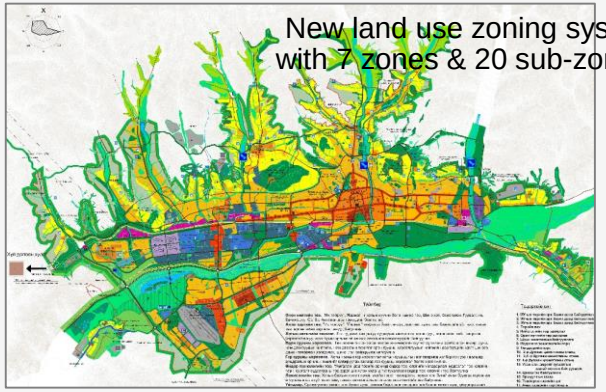


Main center: 2
Sub-center: 6
Satellite centers: 14

SPATIAL STRUCTURE



	Area /ha/	Road Network /km/
Constructed area	6313.5	555.1 /71.2%/
Ger dwelling area	10171.1	224.1 /28.8%/



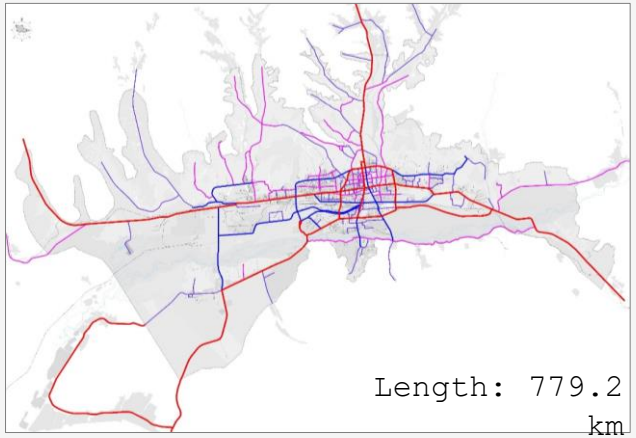
Redevelopment of *ger* areas

- Utilities partially supplied from the central system and/or through an independent utility infrastructure
- Medium & high density apartment complexes

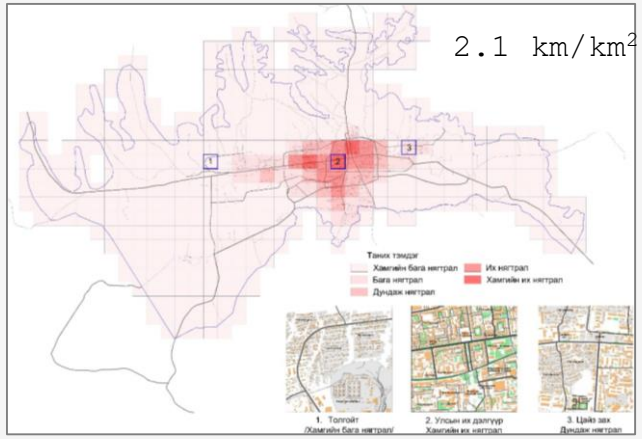
1.2. ROAD DEVELOPMENT PLAN /Long and Medium-term MP for the Road Network Development of the Capital City/

Current

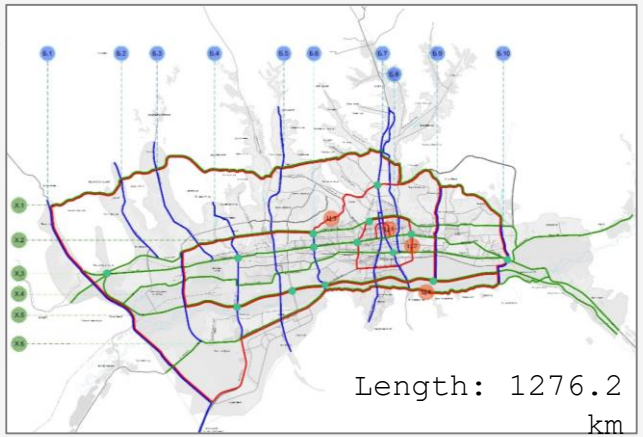
ROAD NETWORK

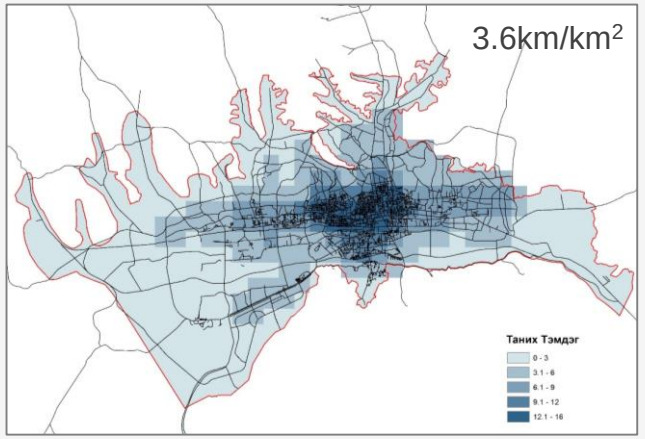


AVERAGE ROAD DENSITY



2030

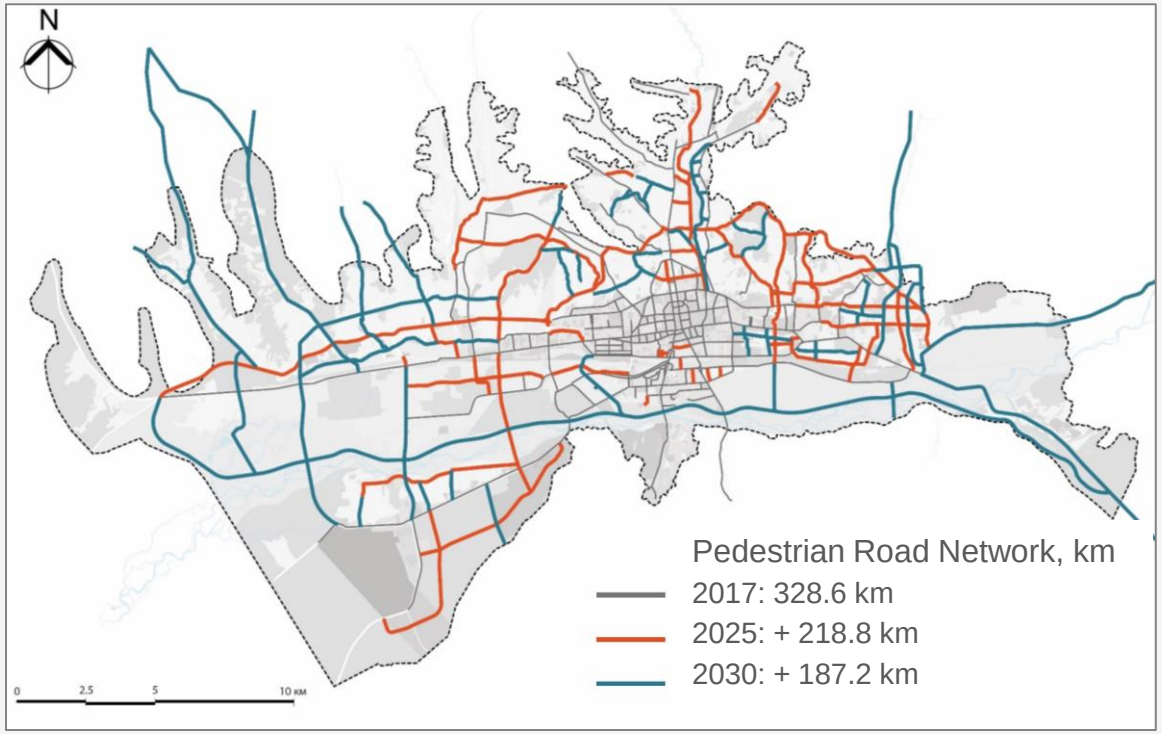




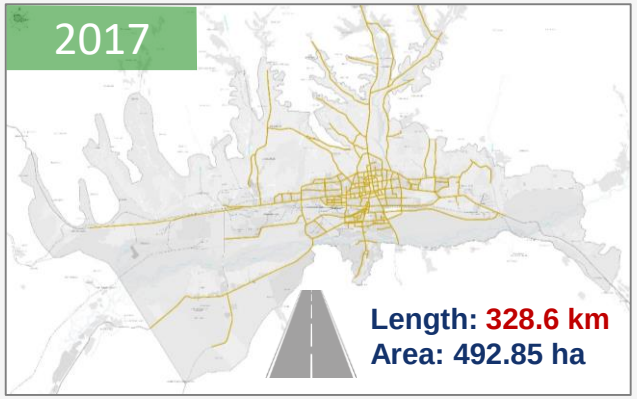
Road classification	Length, km		
	2017	Until 2025	Until 2030
1st degree Primary road	93.6	130.1	167.1
2nd degree Primary road	55.1	93.8	111.7
1st degree Secondary road	106.5	164.9	254.1
2nd degree Secondary road	119.5	177	264.4
Residential area streets	404.6	464.6	516.3
New construction for primary road		290.4	534.4
New construction for secondary road		230.4	422.9
TOTAL ROAD LEGNTH, KM	779.3	1069.5	1313.6

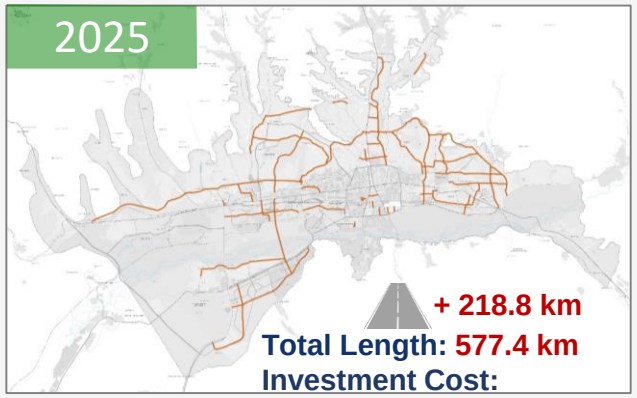
Direction/Route of Primary Road & Streets	Number of Direction /Route		Number of Streets within the Direction /Route		Length /km/ (overlapped)	
	2017	2030	2017	2030	2017	2030
Links East-West – Horizontal Road	4	6	25	28	87.1	193.0
Links North-South – Vertical Road	8	9	13	27	85.1	96.5
Circle Road	3	4	7	25	16.2	143.

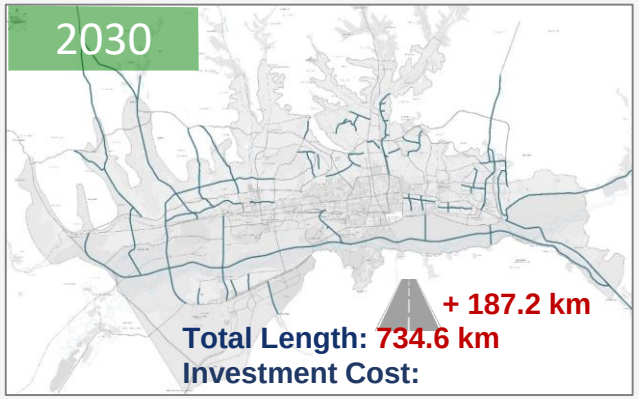
PEDISTRAIN ROAD NETWORK PLANNING UNTIL 2030



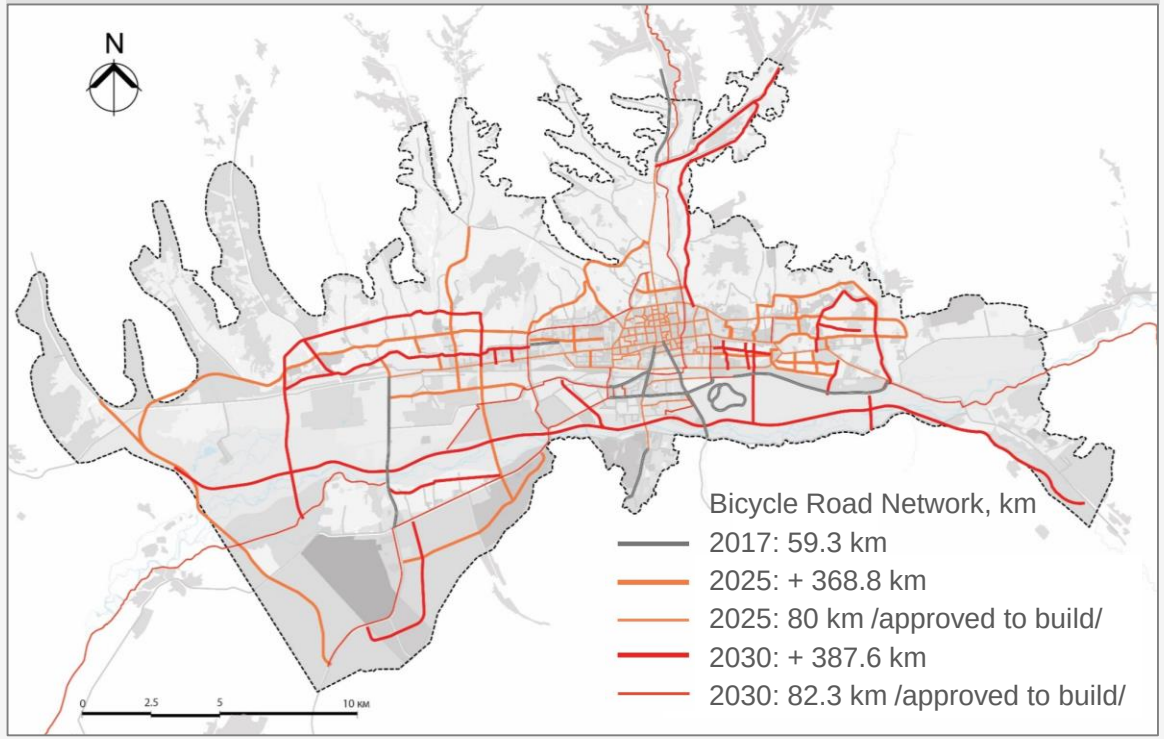
CURRENT CONDITIONS & PROBLEMS:



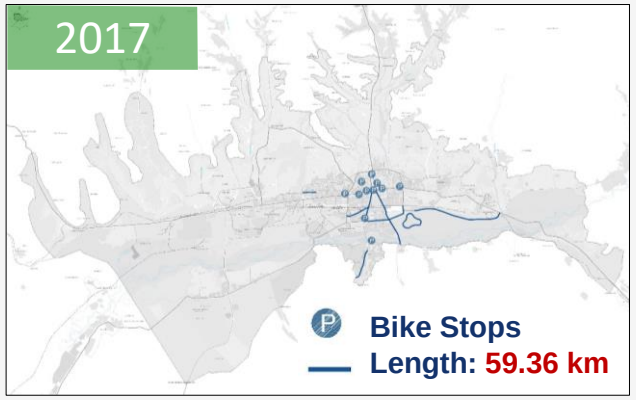


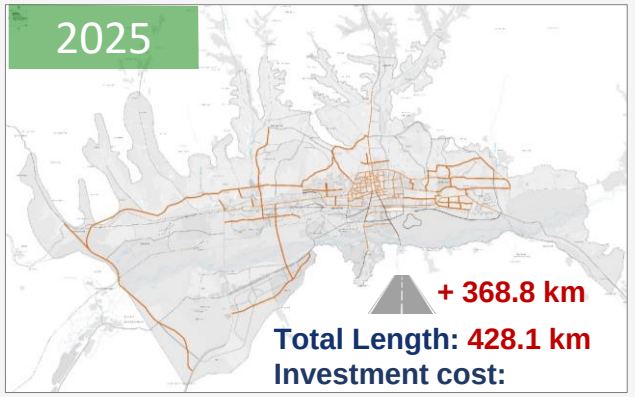


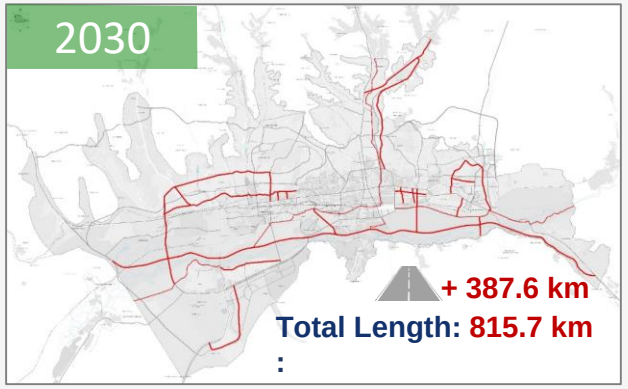
BICYCLE ROAD NETWORK PLANNING UNTIL 2030



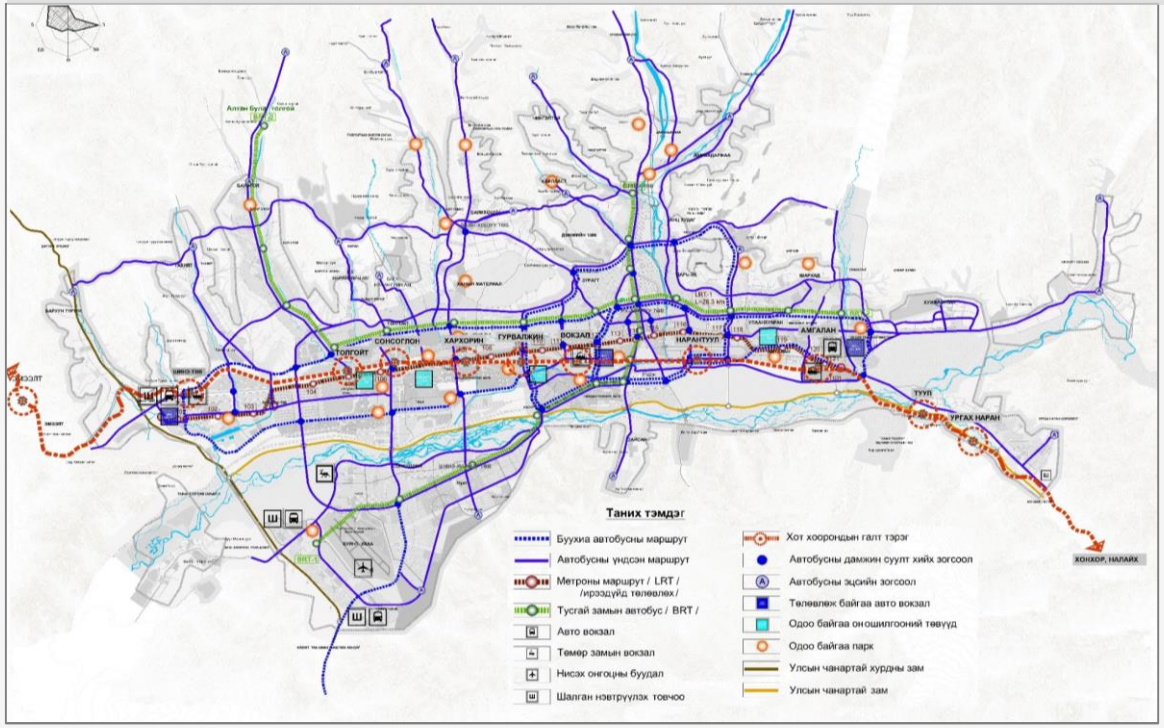
CURRENT CONDITIONS & PROBLEMS:



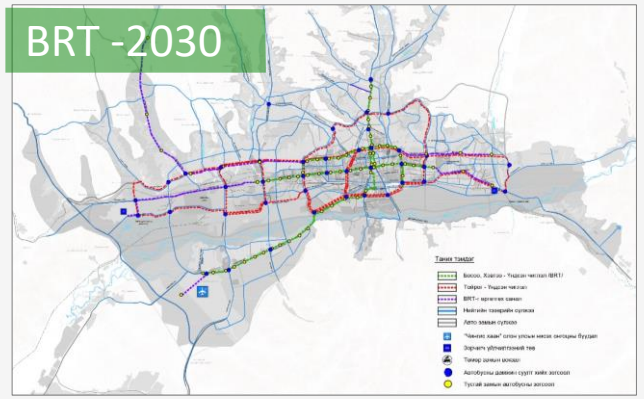




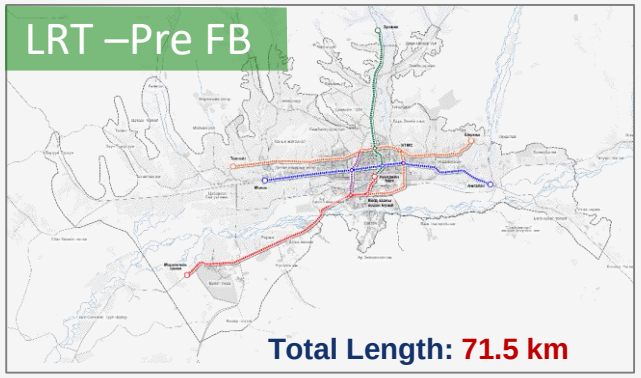
UBMP 2020/2030: PUBLIC TRANSPORTATION PLANNING UNTIL 2030



BRT -2030

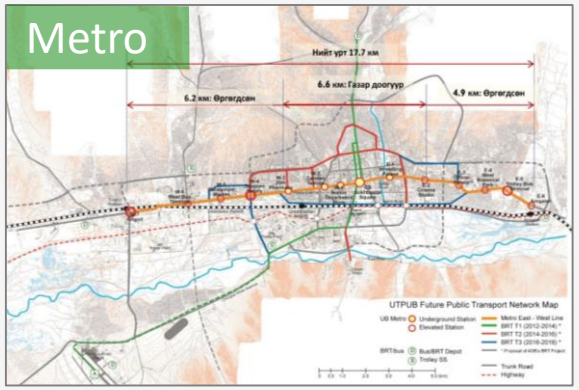


LRT –Pre FB

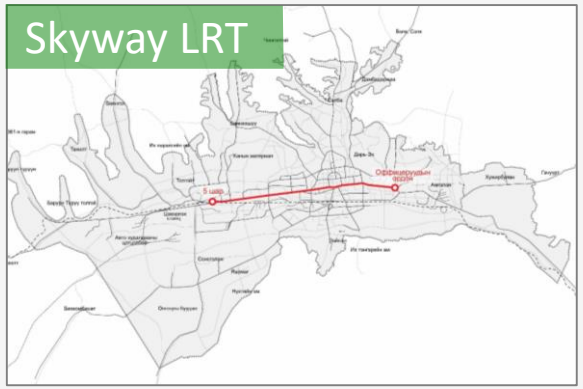


Corridor 1: 22.3 km
Corridor 2: 19.5 km
Corridor 3: 11.2 km
Corridor 4: 18.0 km

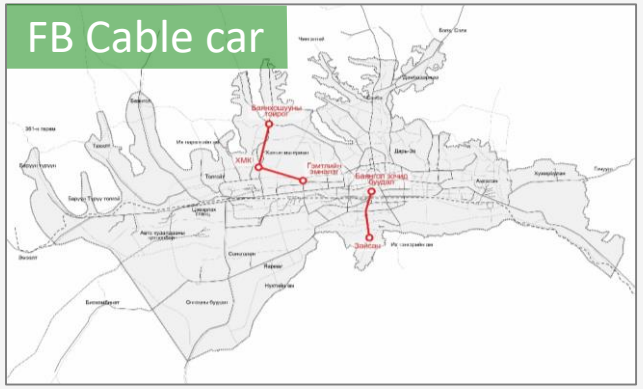
Metro



Skyway LRT



FB Cable car



Option 1: 4.9 km
Option 2: 4.6 km
Option 3: 2.6 km
Option 4: 5.5 km
Option 5: 5.5 km

1.3. SCORE CARD FOR SUTI - 1

Aspects	Approach			Explanation summary	Score 2017	Score 2021
	Stating clear goals & visions for each aspects	Designating infrastructure, facilities & measures for each aspect in the plan	Allocating funding, specifying budgets, securing finance for facilities			
Walking Network	Goals are strong and very ambitious. Pedestrian road network will be increased from 328.6 km to 547.4 km by 2025 (an increase of 66.58%) and to 734.6km by 2030 (an increase of 123% compared to 2018).	A transport plan designated measures to be built as shown on maps, listed in tables. The plan has strong effort and extensive coverage.	A plan states required investment cost for building and maintenances for pedestrian road network until 2030 by annually. Even though budget is not secured.	UB Road MP 2025/2030 is still not approved yet. Implementation process is an issue due to budget and politics	2.5	2.5
Cycling Network	Goals are strong and very ambitious. Pedestrian road network will be increased from 328.6 km to 547.4 km by 2025 (an increase of 66.58%) and to 734.6km by 2030 (an increase of 123% compared to 2018).				2.5	2.5
Intermodal Transfer Facilities	Although the plan is included expansion of the walking, cycling network, and public transport network system, there is not clear goals for building intermodal terminals and/or connecting intermodal transfer facilities. Unclear public transport development plan has impacted to plan building intermodal transfer facilities.	The extent of the designation is not clear as well as the details.	It has no/limited efforts and o budget.	Vague goal, little designation seen in plan, small or unclear budget	1.0	1.0
Public transport	There is not any master plan for public transport development. There are several PT development concepts.	The extent of the designation is not clear as well as the details.	A plan states required investment cost.	Although some budget is secured, political impacts to implementing process are strong.	2.0	2.0

Aspects	Score	Year	Comments
Sum score for Indicator I	8	2017	The score is based on UB MP2020/2030 and UB Road MP2025/2030. Scoring conducted by 3 person team chaired by Dr. Eldev-Ochir.
	8	2021	

SUT 02I

MODEL SHARE OF ACTIVE AND PUBLIC TRANSPORT IN COMMUTING

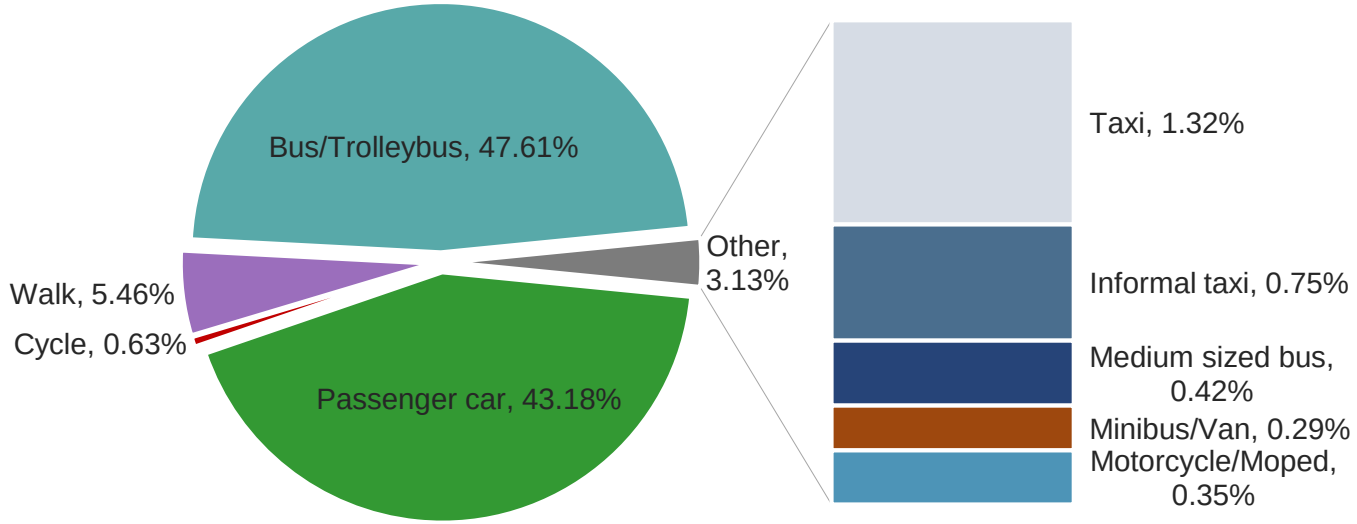
Assessment Of Urban Mobility: Ulaanbaatar

SCORE: 10%-90%

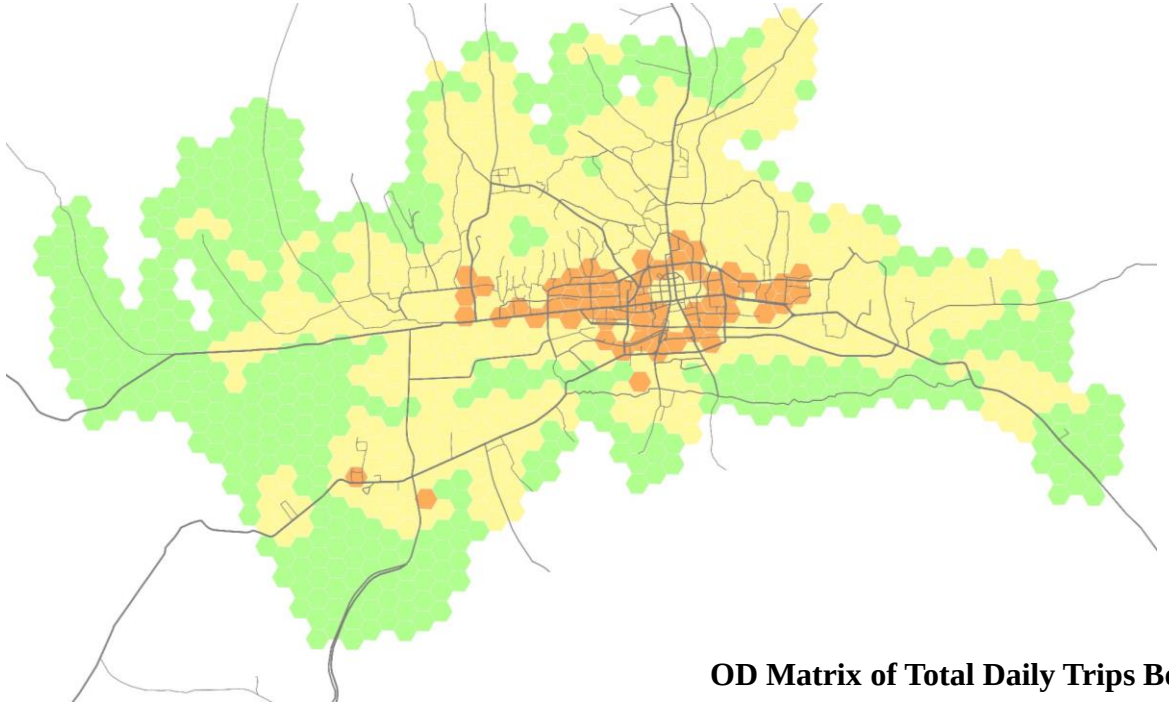
1. Active transport: Cycling & Walking
2. Public Transport: Bus & Trolleybus
3. Personal motorized vehicles: Passenger cars

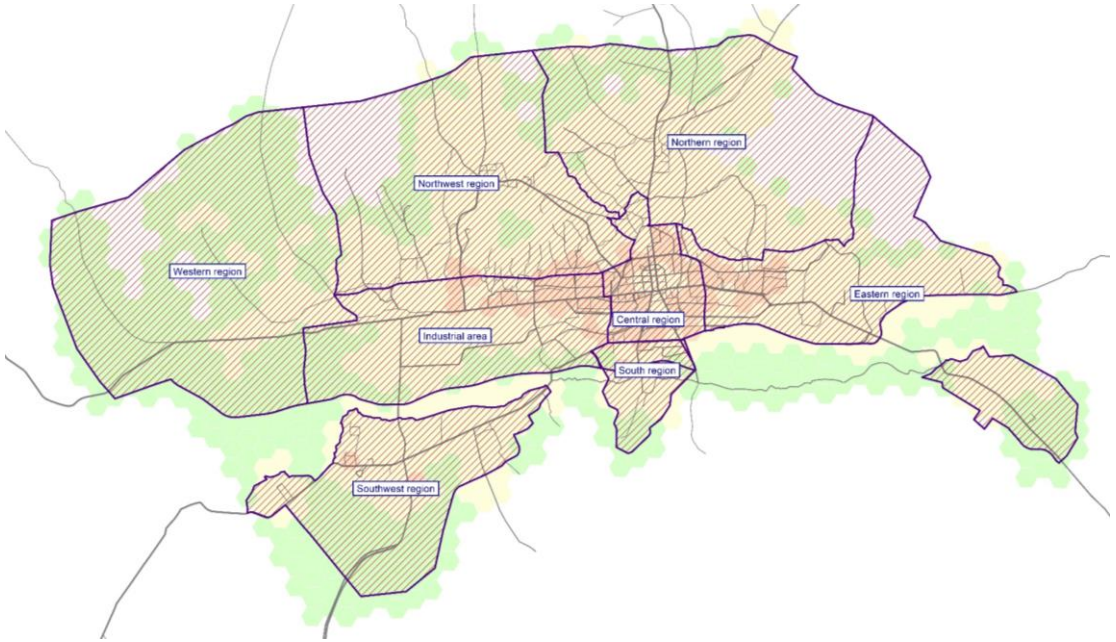
2.1. MODEL SHARE OF ACTIVE AND PUBLIC TRANSPORT IN COMMUTING

Travel Mode	Education Travel	Trip Rate for Education	Work	Trip Rate for Work	Average Trip Rate for Work & Education	Modal Share for Education & Work
Bus/Trolleybus	26876	0.5663	13397	0.386	0.476	47.61%
Passenger car	17880	0.3768	16900	0.487	0.432	43.18%
Taxi	33	0.0007	893	0.026	0.013	1.32%
Informal taxi	230	0.0048	350	0.010	0.007	0.75%
Medium sized bus	113	0.0024	206	0.006	0.004	0.42%
Minibus/Van	113	0.0024	121	0.003	0.003	0.29%
Cycle	82	0.0017	378	0.011	0.006	0.63%
Walk	2128	0.0448	2233	0.064	0.055	5.46%
Motorcycle/Moped		0.0000	240	0.007	0.003	0.35%
Grand Total	**47455**	**1.0000**	**34718**	**1.000**	**1.000**	**100.00%**



2.1. MODEL SHARE OF AVERAGE DAILY TRIPS

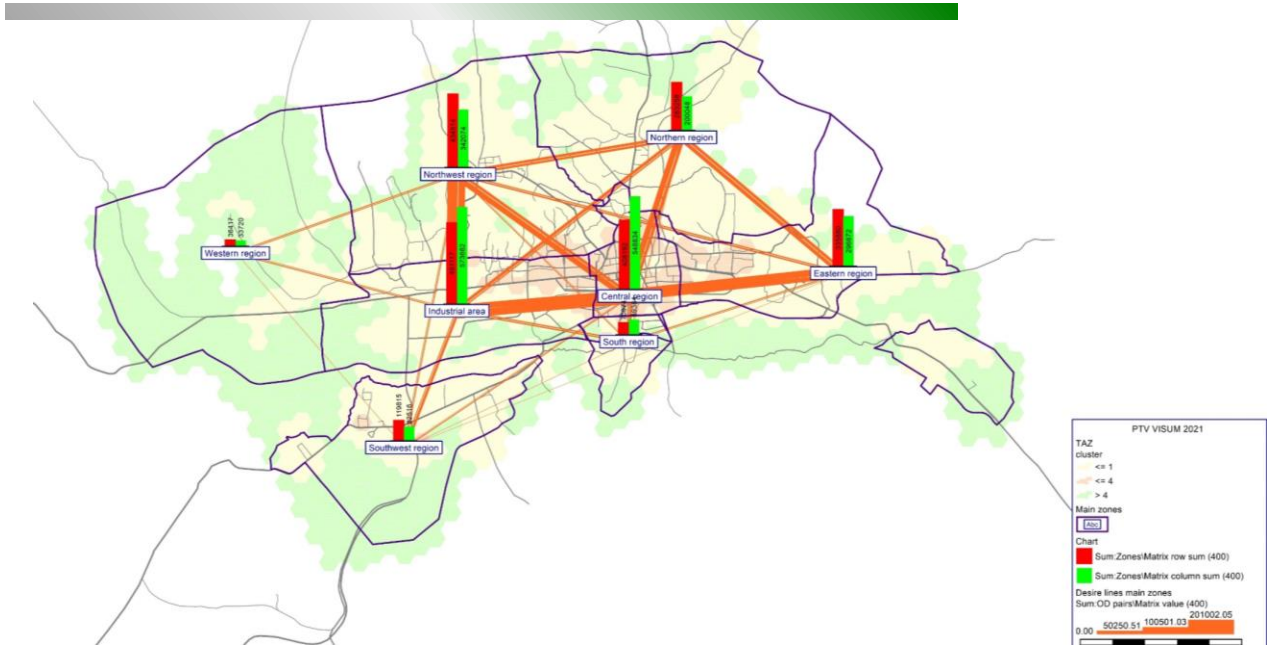




OD Matrix of Total Daily Trips Between Aggregated Zones

Main zone	Unsettled area	Central	East	Industrial area	Nort	Northwest	South	Southwest	West	Total
Unsettled area	490	5122	3158	6436	1930	2560	1556	3077	570	24898
Central	4924	173732	65345	90196	45927	42327	23153	5945	1755	453305
East	5301	101370	139817	44873	45774	16522	14682	3438	1225	373001
Industrial area	4842	111589	27467	223216	19133	104418	19695	14554	9375	534289
North	3184	88515	56125	44738	67842	39512	10355	2915	1378	314563
Northwest	3726	83299	22592	157644	34912	143621	12926	10163	13653	482536
South	1545	26992	9142	18572	4042	5310	10228	2587	399	78818
Southwest	3996	15210	4638	36594	1952	13114	5714	45941	5899	133057
West	507	3660	1176	14794	646	12495	954	3015	3194	40441
Total	28515	609490	329460	637062	222157	379879	99262	91636	37447	2434908
Net Trip	-3617	-156185	43541	-102773	92405	102656	-20444	41421	2995	

2.1. MODEL SHARE OF AVERAGE DAILY TRIPS



Ulaanbaatar is 2,434,908, of which 64.7% (1,575,708 cars) are by private vehicle, 25.3% (616,880 passengers) are by public transportation, and 10% (242,321 trips) are by active mobility.

Aggregated zone	Origin Trips				Destination Trips				Share in Total Trips
	Total	Private vehicles	Public Transport	Active Mobility	Total	Private vehicles	Public Transport	Active Mobility	
Unsettled area	24,898	15,523	6,898	2,478	28,515	18,376	7,301	2,838	1.10%
Central	453,305	297,617	110,576	45,113	609,490	408,956	139,878	60,656	21.82%
East	373,001	240,491	95,389	37,121	329,460	212,501	84,171	32,788	14.42%
Industrial	534,289	349,169	131,947	53,172	637,062	413,785	159,877	63,400	24.05%
North	314,563	202,343	80,915	31,305	222,157	137,390	62,659	22,109	11.02%
Northwest	482,536	310,795	123,719	48,022	379,879	236,227	105,847	37,805	17.71%
South	78,818	50,178	20,795	7,844	99,262	65,148	24,235	9,879	3.66%
Southwest	133,057	84,611	35,204	13,242	91,636	59,116	23,401	9,120	4.61%
West	40,441	24,980	11,437	4,025	37,447	24,209	9,512	3,727	1.60%
Total	2,434,908	1,575,708	616,880	242,321	2,434,908	1,575,708	616,880	242,321	

2.2. SCORE CARD FOR SUTI -2

Travel Purpose	Commuting (work and education)		
Mode	#	Subtotals (2018)	2021
a. Scheduled bus and minibus (*)	0.483		
b. Taxi	0.013		
c. Ferry			
d. Public transport (a+b+c)	**0.496**	**0.5**	**0.253**
e. Walking	0.055		
f. Bicycle	0.006		
g. Active transport (e+f)	**0.061**	**0.06**	**0.100**
h. Passenger car	0.432		
i. 3W - Private			
j. Shared Auto (Informal PT)	0.007		
k. Motorcycle	0.004		
l. Institutional Buses and Auto Rickshaws			
m. Other motorized (trucks,etc)			
n. Individual motorized (**) (h+i+j+k+l+m)	**0.443**	**0.44**	**0.647**
o. Total (d+g+n)		**1.00**	**1.00**
p. Public and active (d+g)		**0.56**	**0.35**
q. Modal share of active and public transport		55.7	54.3

Indicator	Value	Year	Comments
Mode share of public transport and active mobility	55.7	2017	Data is based on urban travel survey 2017 from 50000 Households
	54.3	2021	Data is based on Travel Demand Household Survey 2021 from 15119 Households

SUT 03

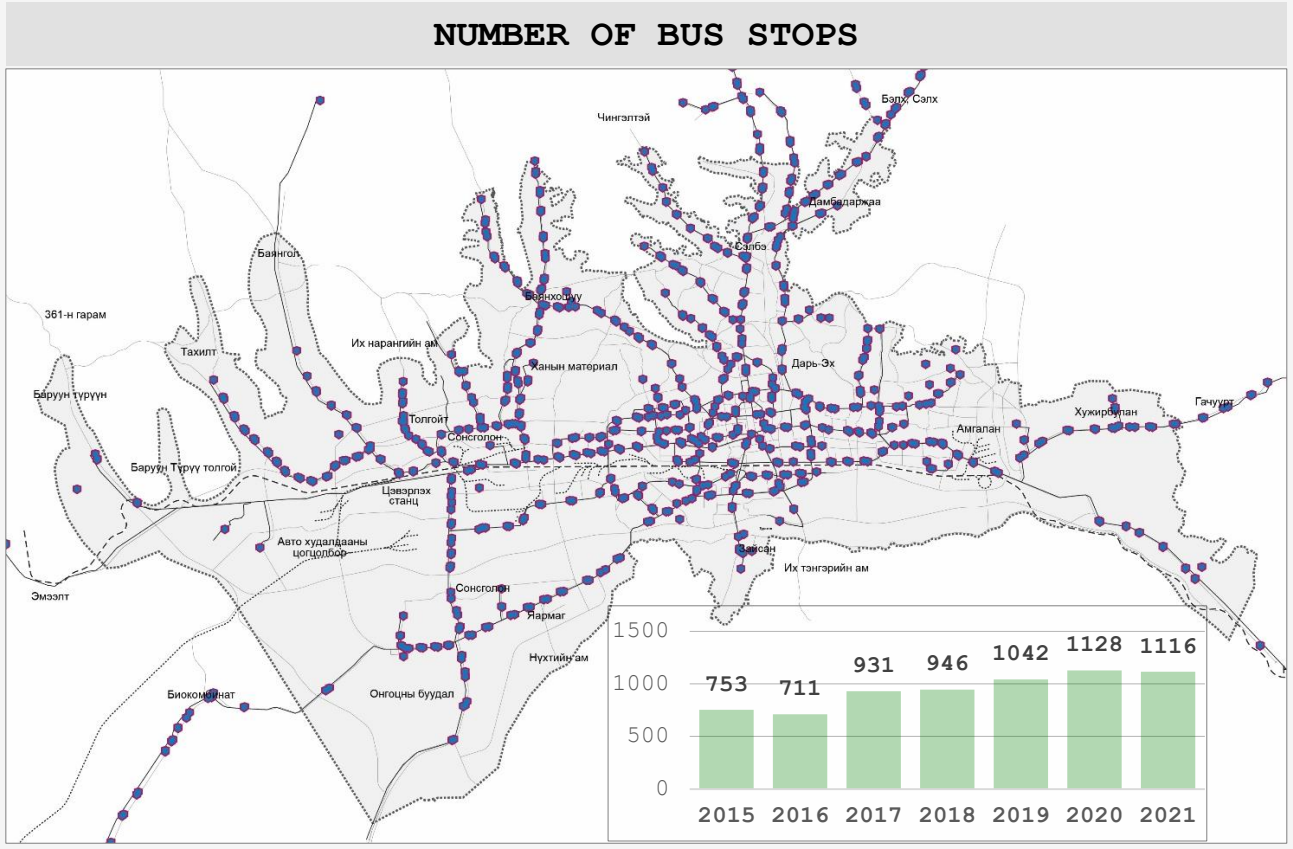
CONVENIENT ACCESS TO PUBLIC TRANSPORT SERVICES

Assessment Of Urban Mobility: Ulaanbaatar

SCORE: 20%-100%

1. Percentage of the population that has convenient access to public transport, defined as living 500 meters or less from public transport stop with a minimum 20-minute service.

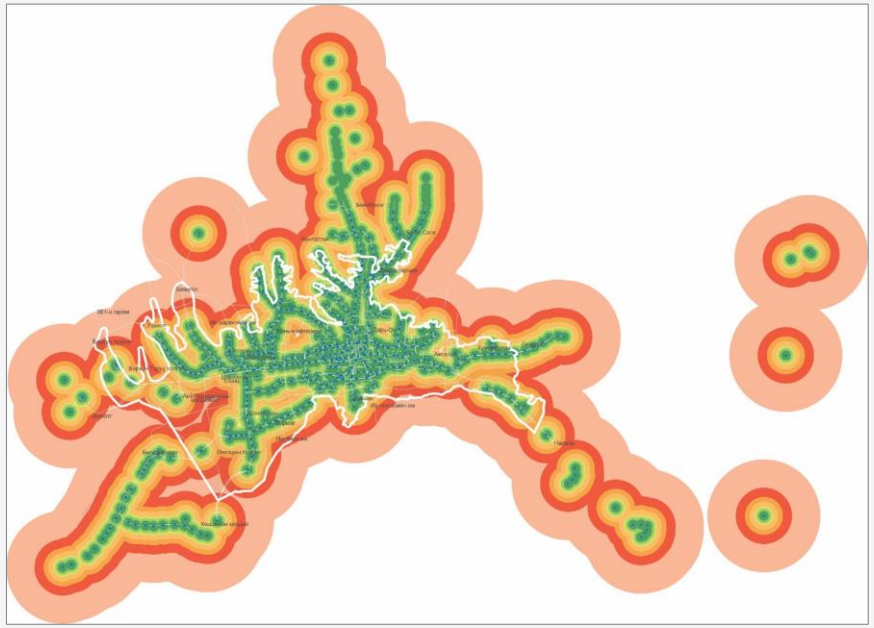
3.1. NUMBER OF BUS STOPS



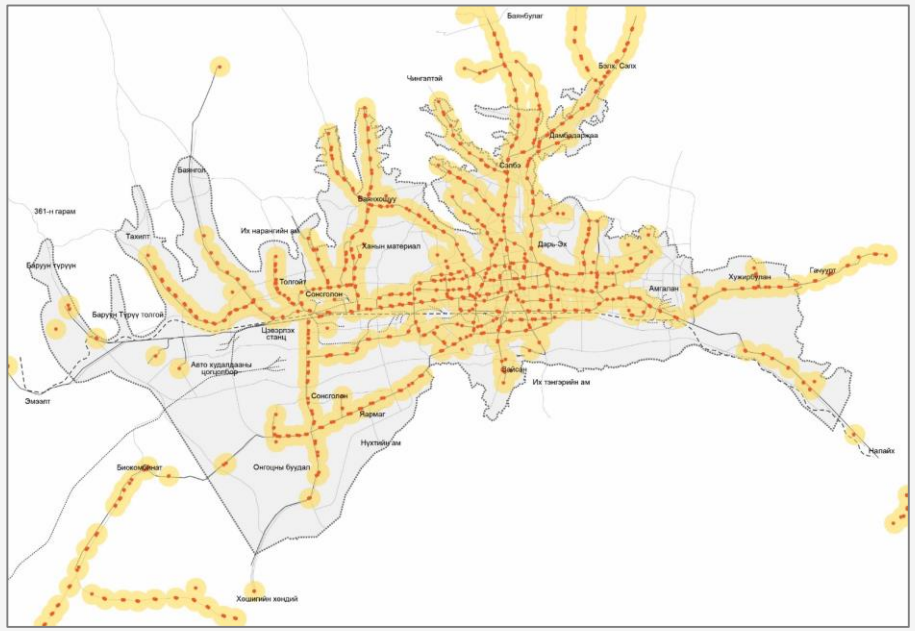
50	2015			2016			2017			2018		
	Total	Final Stops	Intermediate Stops	Total	Final Stops	Intermediate Stops	Total	Final Stops	Intermediate Stops	Total	Final Stops	Intermediate Stops
Han-Uul	59	9	50	59	9	50	187	9	178	189	9	180
Bayanzurh	190	19	171	189	19	170	209	13	196	216	13	203
Bayangol	76	3	73	76	3	73	51	2	49	52	2	50
Suhbaatar	130	7	123	120	5	115	183	7	176	184	7	177
Chingeltey	103	6	97	72	6	66	83	6	77	87	6	81
Songinohayrhan	195	25	170	195	25	170	216	18	198	218	18	200

3.2. ACCESS TO PUBLIC TRANSPORT

Multi-buffers (Access to Public Transport)



500 m Buffers (Access to Public Transport)



Total population of UB: 1,347,598 (core 6 districts)

Distance /m/ from Bus Station	Walking minutes	Area /km²/	Number of Households in the Area	Number of People Living in the Area	Population Density, inh/km²	Percentage of the population access to public transport
420	5 min	206.47	280297	1069358	5179.3	79.4%
500	6 min	249.16	301007	1147289	4604.7	85.1%
670	5-8 min	126.26	46564	174532	1382.3	13.0%
830	8-10 min	74.18	12529	47697	643.0	3.5%
1250	10-15 min	184.33	12288	47004	255.0	3.5%
1670	15-20 min	168.98	3299	12107	71.6	0.9%
2500	20-30 min	301.94	1447	5065	16.8	0.4%
5000	30-60 min	829.63	736	1986	2.4	0.1%

3.3. SCORE CARD FOR SUTI - 3

Number of bus stops	Coverage area within a radius of 500m, km^2	Pop. Density inh/km^2	Number of Inhabitants
931	249.2	4605	1,147,289
Total Population			1,347,598
% within 500m buffers			85.14

Number of bus stops	Coverage area within a radius of 500m, km^2	Pop. Density inh/km^2	Number of Inhabitants
1116	249.2	5051	1,258,496
Total Population			1,466,431
% within 500m buffers			85.82

50	Value	Year	Comments
Convenient access to public transport services	**85.14**	2018	Data is based on the population data from National Statistics Office in areas within 500 m of nodes and the bus stops data from the Public Transport Department of the Capital City.
	85.82	2021	

SUTI 04

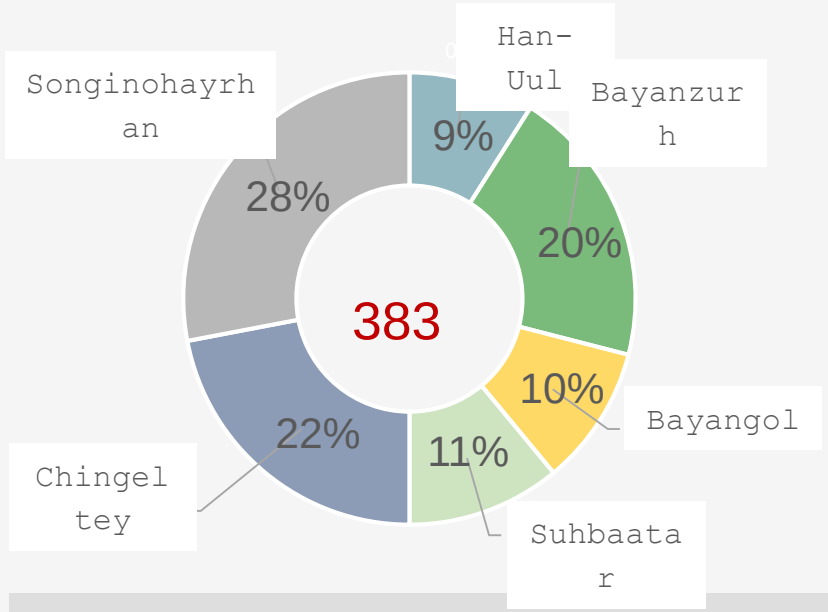
PUBLIC TRANSPORT QUALITY AND RELIABILITY

Assessment Of Urban Mobility: Ulaanbaatar

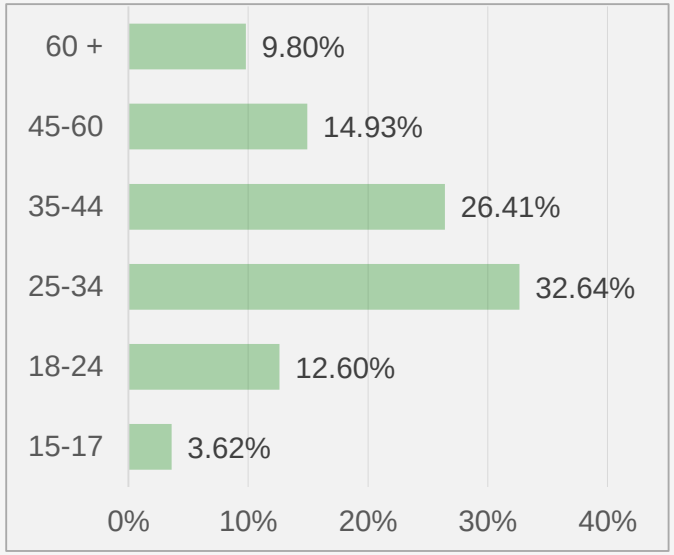
SCORE: 30%-95%

1. The degree to which passengers of the public transport system are satisfied with the quality of service while using the different modes of public transport.

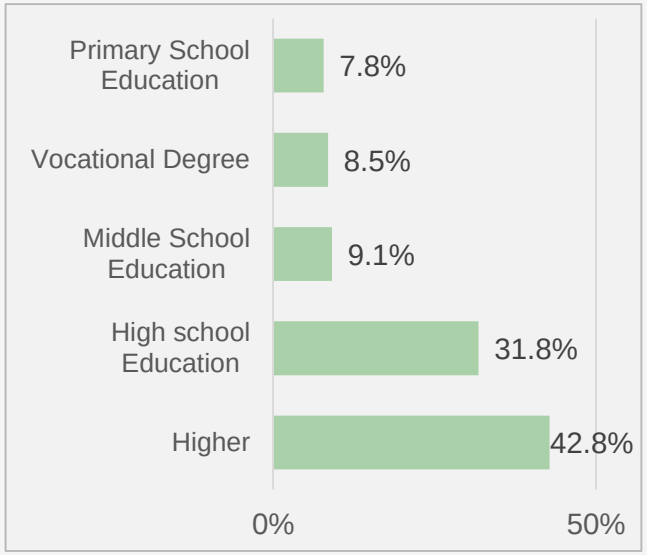
4.1. PUBLIC TRANSPORT QUALITY AND RELIABILITY SURVEY, 2018 & 2021



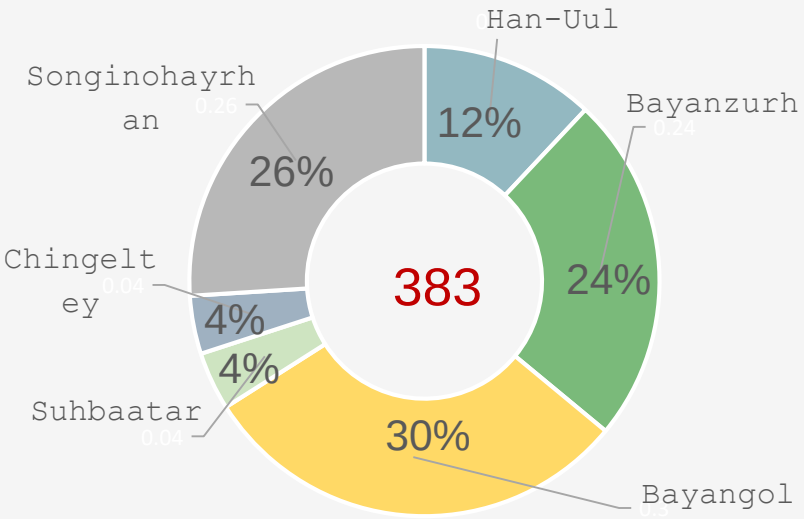
PARTICIPANTS BY DISTRICTS

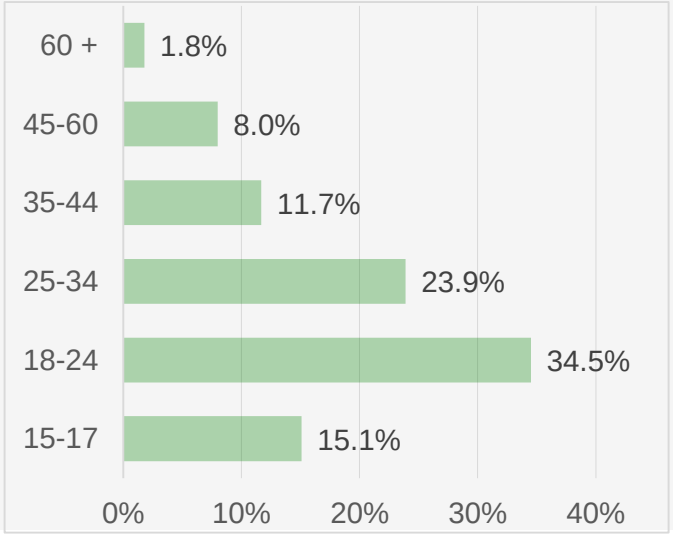


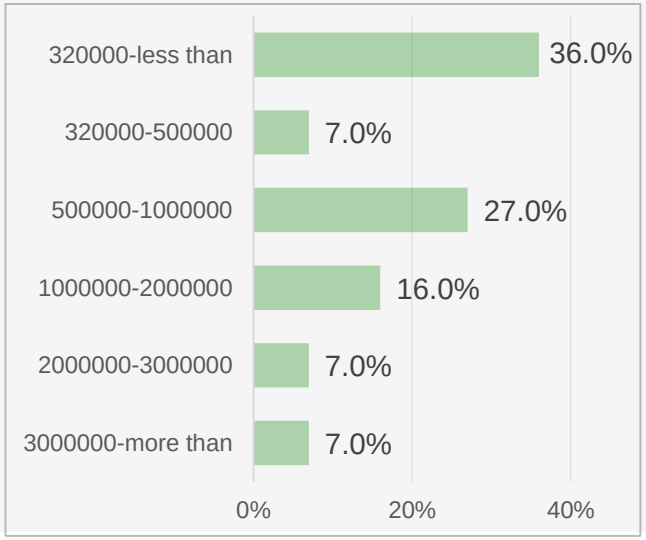
PARTICIPANTS BY AGE GROUP



PARTICIPANTS BY EDUCATION







4.2. SURVEY RESULT & SCORE CARD FOR SUTI -4

2018

Distance /m/ from Bus Station	Dissatisfied			Neutral	Satisfied			RESP	AV Score	SATISFACTION	DIS-SATISFACTION
	Very		Partly		Partly		Very				
Dimension	1	2	3	4	5	6	7				
Frequency of the service	7	13	46	86	142	80	8	382	4.61	60.21%	17.3%
Punctuality (delay)*	11	16	72	89	121	48	25	382	4.41	50.79%	25.9%
Comfort and cleanliness of vehicles	9	24	61	79	133	59	18	383	4.44	54.83%	24.5%
Safety of vehicles	24	37	68	65	111	63	15	383	4.18	49.35%	33.7%
Convenience of stops/stations	7	18	21	98	118	110	10	382	4.76	62.30%	12.0%
Availability of information	20	50	62	67	139	33	11	382	9.74	47.91%	34.6%
Personnel courtesy	34	43	58	65	110	53	18	381	4.06	47.51%	35.4%
Fare level	2	4	32	68	111	101	65	383	5.21	72.32%	9.9%
TOTAL	**114**	**205**	**420**	**617**	**985**	**547**	**170**	**3058**	**4.46**	**55.65%**	**24.2%**

2021

Distance /m/ from Bus Station	Dissatisfied			Neutral	Satisfied			RESP	AV Score	SATISFACTION	DIS-SATISFACTION
	Very		Partly		Partly		Very				
Dimension	1	2	3	4	5	6	7				
Frequency of the service	16	12	6	10	37	18	10	109	4.23	59.63%	31.2%
Punctuality (delay)*	16	16	10	14	36	14	4	110	3.87	49.09%	38.2%
Comfort and cleanliness of vehicles	46	18	12	13	13	7	18	127	3.17	29.92%	59.8%
Safety of vehicles	29	19	20	13	19	9	15	124	3.49	34.68%	54.8%
Convenience of stops/stations	35	21	12	11	19	8	2	108	2.91	26.85%	63.0%
Availability of information	10	10	6	13	17	32	21	109	6.46	64.22%	23.9%
Personnel courtesy	23	13	16	10	30	15	2	109	3.59	43.12%	47.7%
Fare level	14	8	4	11	23	30	18	108	4.69	65.74%	24.1%

Indicator	Value	Year	Comments
Public transport quality and reliability	55.65	2018	Based on satisfaction survey on three main bus lines.
	46.66	2021	

SUTI 05

TRAFFIC FATALITIES PER 100000 INHABITANTS

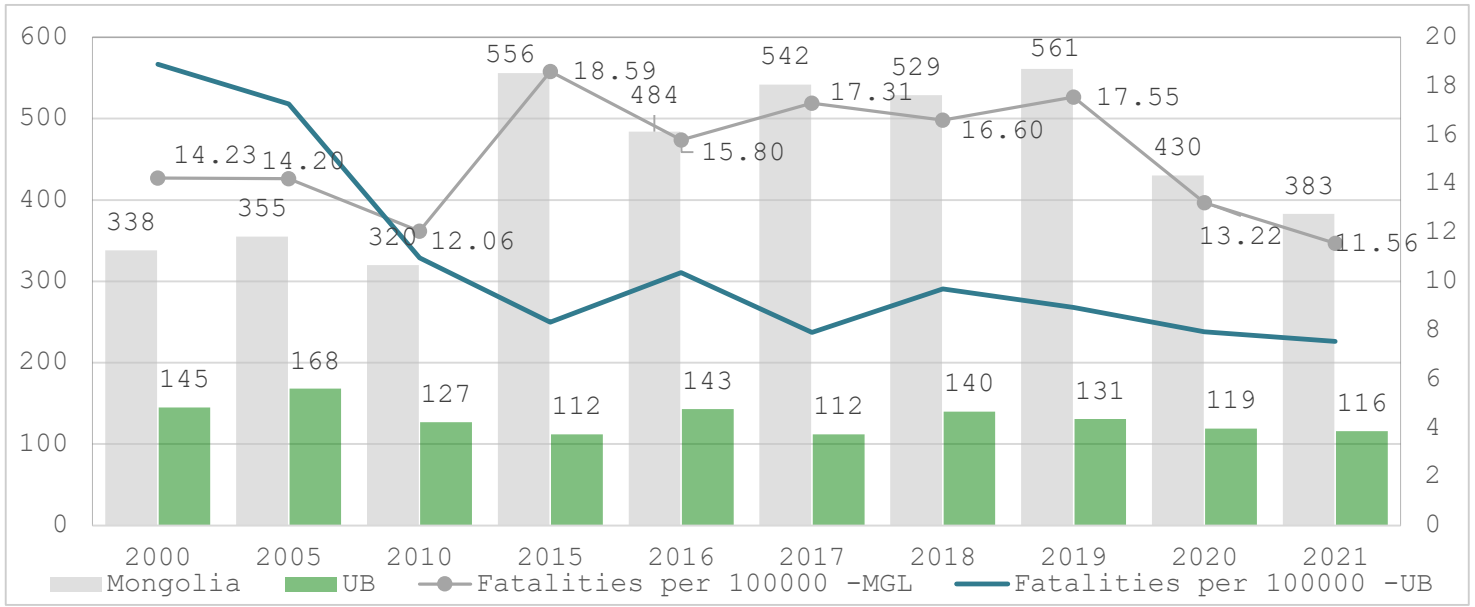
Assessment Of Urban Mobility: Ulaanbaatar

SCORE: 30%-95%

1. Fatality in traffic (road, rail, etc.) in the urban areas per 100000 inhabitants. As defined by the WHO, a death counts as related to a traffic accident if it occurs within 30 days after the accident.

5.1. PUBLIC TRANSPORT QUALITY AND RELIABILITY SURVEY, 2018 & 2021

NUMBER OF TRAFFIC FATALITIES

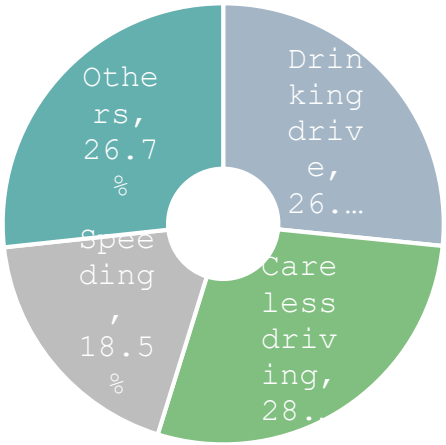


SCORE CARD

Transport Mode	Number of Fatalities	
	2018	2021
Road transport	140	116
Railway transport		
Tram		
Ferryboats		
Other		
TOTAL	**140**	**116**
Inhabitants	**1,417,396**	**1,539,252**
Fatalities/100000 inh	**9.7**	**7.5**

FATALITIES REASON

2018



2021.I

Indicator	Value	Year	Comments
Traffic fatalities per 100000 inhabitants	9.7	2018	Based on official statistics from Traffic Police Department and National Statistics Office of Mongolia.
	7.5	2021	

SUT 06I

AFFORDIBILITY – TRAVEL COSTS AS SHARE OF INCOME

Assessment Of Urban Mobility: Ulaanbaatar

SCORE: Min /worst/ value: 35%
Max /best/ value: 3.5%

Cost of a monthly network-wide public transport ticket covering all main modes in the city, compared to the mean monthly income for the poorest quartile of the population of the city.
Required data:

- The costs of using public transport
- The average monthly income of the poorest part of the population

6.1. FARE PAID RIDERSHIP /thous. people/ & FARE REVENUE /thous. MNT/, 2018 & 2021

Month	Total Ridership	Adult	Children	Ridership* with promotional card		Free Ridership					Total Fare Revenue
				Adult	Children	Students	Donors	Seniors	Disabilities	State Inspector/ Police Officers in Duties	
Jan	14037.15	7800.28	2011.39	338.17	76.17	0.21	7.41	2643.07	1103.58	56.88	3609784.70
Feb	12768.61	6039.50	1987.12	270.86	111.12	1061.42	6.48	2308.88	940.44	42.79	2898706.40
Mar	16962.10	8092.37	2629.65	391.60	157.20	1274.77	7.93	3112.26	1239.83	56.50	3858626.50
Apr	17112.72	8063.23	2611.69	417.16	161.10	1271.46	7.62	3262.77	1262.57	55.13	3833536.20
May	17655.12	8408.52	2520.25	462.52	168.08	1231.13	2.72	3483.50	1319.48	58.93	3972418.20
Jun	14030.84	7059.13	1722.85	329.46	82.08	739.98	5.89	2913.24	1130.82	47.38	3259985.30
July	11514.41	6246.06	1347.54	271.97	43.49	0.05	6.44	2546.75	1013.84	38.27	2840567.70
Aug	14134.16	7789.22	1851.72	333.36	49.15	0.00	7.68	2906.25	1154.47	42.30	3596440.80
Sep	15977.14	8142.07	2719.65	405.35	105.82	349.30	7.38	3066.43	1142.94	38.22	3937022.40
Oct	17130.76	8273.22	2597.82	463.61	124.57	1009.31	8.17	3382.53	1225.14	46.40	3955253.70
Nov	15423.26	7281.11	2222.94	427.39	109.86	1161.88	8.00	3045.08	1122.13	44.88	3453446.20
Dec	14223.34	6615.04	1977.95	402.43	106.77	1176.16	7.94	2828.78	1073.22	35.08	3129421.80
TOTAL	**180969.61**	**89809.73**	**26200.56**	**4513.86**	**1295.41**	**9275.67**	**83.66**	**35499.54**	**13728.44**	**562.75**	**42345209.90**

- Monthly promotional card for unlimited ridership:

Price: Adult 25000 MNT, Child 8000MNT per month

6.2.

2018: FARE PAID RIDERSHIP /thous. people/ & FARE REVENUE *

Month	Regular Fare Paid Adult* /thous. people/	Regular Fare Paid Amount /thous. MNT/	Cost per Ride /MNT/	Monthly Cost with Regular Fare per Person** /MNT/	Promotional Fare Paid Adult** /thous.people/	Monthly Cost with Promotional Fare per Person***/MNT/	Weighted Monthly Cost for PT per person****/MNT/
Jan	7800.28	3600721.03	461.61	41545	338.17	33000	41190.22
Feb	6039.50	2891046.07	478.69	43082	270.86	33000	42649.33
Mar	8092.37	3847578.86	475.46	42791	391.60	33000	42339.25
Apr	8063.23	3821818.57	473.98	42658	417.16	33000	42183.20
May	8408.52	3959510.63	470.89	42380	462.52	33000	41891.29
Jun	7059.13	3251092.11	460.55	41450	329.46	33000	41072.84
July	6246.06	2833420.50	453.63	40827	271.97	33000	40500.41
Aug	7789.22	3587713.54	460.60	41454	333.36	33000	41107.04
Sep	8142.07	3926042.06	482.19	43397	405.35	33000	42904.24
Oct	8273.22	3942666.93	476.56	42890	463.61	33000	42365.38
Nov	7281.11	3441882.72	472.71	42544	427.39	33000	42015.11
Dec	6615.04	3118507.02	471.43	42428	402.43	33000	41887.76
TOTAL	**89809.73**	**42222000.03**			4513.86		

AVERAGE MONTHLY COST PER PERSON /MNT/: 41842.172

Assumptions:

* Adults pay the public transport fare both own and children.

** Average daily ride for public transport is 3 times. Monthly cost with regular fare = cost per ride*3*30 days

*** Monthly cost per promotional fare adult is 33000MNT =25000MNT per adult +8000 MNT per child

****Weighted average of monthly cost per person with regular fare and promotional fare.

6.3. SURVEY RESULT & SCORE CARD FOR SUTI -6

AFFORDIBILITY – TRAVEL COSTS AS SHARE OF INCOME

Services	2018		2021	
	Value /MNT/	Value /USD/ (1 USD = 2686 MNT/	Value /MNT/	Value /USD/ (1 USD = 2849 MNT/
Monthly Cost per Adult for Public Transport (Bus & Trolleybus) /MNT/	41,842.17	15.58	54,190.03	19.02
Minimum Subsistence Level of Population, per capita per month	198,600.00	74.10	238,700.00	83.78
AFFORDABILITY - COSTS AS SHARE OF INCOME	**21.1%**	**21.1%**	**22.7%**	**22.7%**

Indicator	Value	Year	Comments
Affordability- travel costs as part of budget	21.1	2018	Public transportation cost estimation data are from U-Money database. Minimum Subsistence Level of Population data from the National Statistical Office of Mongolia.
	22.7	2021	

SUTI 07

OPERATIONAL COSTS OF THE PUBLIC TRANSPORT SYSTEM

Assessment Of Urban Mobility: Ulaanbaatar

SCORE: Min /worst/ value: 22%
Max /best/ value: 100%

1. Ratio of fare revenue to operating costs for public transport systems.

7.1. SURVEY RESULT & SCORE CARD FOR SUTI -6

ESTIMATING FARE BOX RATIO

№	Name of Companies	Market Share* /%/	Fare Revenue + Reimbursement /mln. MNT/	Transportation Costs /mln.MNT/	Fare Box Ratio /%/
1	Company-1	22.94%	28495.14	36492.97	17.91%
2	Company-2	1.31%	1384.00	1889.53	0.96%
3	Company-3	2.59%	3465.60	2546.68	3.53%
4	Company-4	1.47%	975.08	898.55	1.60%
5	Company-5	2.38%	1875.55	2591.72	1.72%
6	Company-6	17.69%	16011.47	16177.58	17.51%
7	Company-7	4.08%	3110.53	4021.09	3.16%
8	Company-8	3.51%	3054.13	4070.38	2.63%
9	Company-9	2.52%	2495.63	2856.85	2.20%
10	Company-10	3.09%	2678.63	3875.70	2.13%
11	Company-11	6.57%	2636.43	7128.67	2.43%
12	Company-12	2.41%	1358.12	1683.14	1.95%
13	Company-13	0.71%	207.26	519.68	0.28%
14	Company-14	1.22%	1291.22	1766.61	0.89%
15	Company-15	8.61%	2483.17	3487.69	6.13%
16	Company-16	5.03%	3486.48	5975.99	2.94%
17	Company-17	10.75%	10843.07	13154.66	8.86%
18	Company-18	3.12%	2689.77	2361.73	3.55%
	TOTAL		**88541.27**	**111499.22**	**80.38%**

* Market share is estimated based on the total number of route, the total length of the total number of ridership and the total revenue of a company.
** Fare Box Ratio = Fare revenue/Transportation cost*Market share

Percentage of Operational Costs covered by fares

Indicator	Value	Year	Comments
Operational costs of the public transport system	80.38%	2018	The data are from the Public Transportation Department of the Capital City.

7.2. SURVEY RESULT & SCORE CARD FOR SUTI -6

ESTIMATING FARE BOX RATIO

№	Name of Companies	Market Share* /%/	Fare Revenue + Reimbursement /mln. MNT/	Transportation Costs /mln.MNT/	Fare Box Ratio /%/
1	Company-1	24.41%	12111.20	31921.17	9.26
2	Company-2	1.30%	646.68	1788.24	0.47
3	Company-3	2.91%	1443.29	5234.06	0.80
4	Company-4	0.70%	347.81	1604.20	0.15
5	Company-5	2.74%	1359.37	2835.24	1.31
6	Company-6	17.48%	8672.33	25654.20	5.91
7	Company-7	5.21%	2583.47	7534.79	1.79
8	Company-8	4.08%	2025.09	5507.58	1.50
9	Company-9	2.85%	1415.24	4493.14	0.90
10	Company-10	4.31%	2137.27	5069.64	1.82
11	Company-11	5.95%	2950.90	8892.56	1.97
12	Company-12	1.37%	680.19	2581.74	0.36
13	Company-13	0.37%	182.83	648.49	0.10
14	Company-14	1.48%	736.14	2344.41	0.47
15	Company-15	5.63%	2795.66	9737.43	1.62
16	Company-16	4.04%	2002.10	5348.73	1.51
17	Company-17	11.98%	5946.00	16060.23	4.44
18	Company-18	2.86%	1420.07	4571.85	0.89
19	Company-19	0.18%	90.41	457.19	0.04
20	Company-20	0.14%	71.52	243.08	0.04
	TOTAL		**49,617.6**	**142,528.0**	**35.35**

Indicator	Value	Year	Comments
Operational costs of the public transport system	35.35%	2021	The data are from the Public Transportation Department of the Capital City.

* Market share is estimated based on the total number of route, the total length of the total number of ridership and the total revenue of a company.

** Fare Box Ratio = Fare revenue/Transportation cost*Market share

Percentage of Operational Costs covered by fares

SUTI 08

INVESTMENT IN PUBLIC TRANSPORTATION SYSTEM

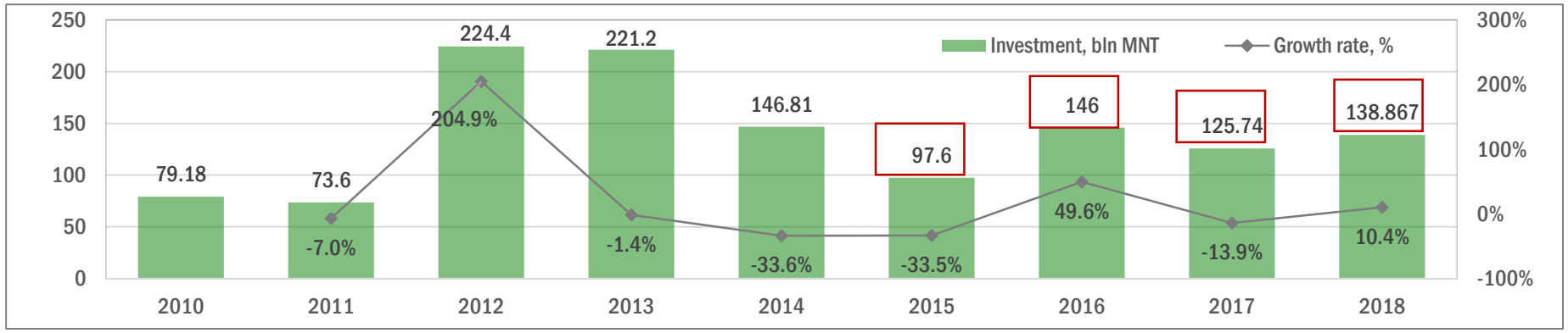
Assessment Of Urban Mobility: Ulaanbaatar

SCORE: Min /worst/ value: 0%
Max /best/ value: 50%

1. The share of all transport investment made in the city that is directed to public transport in the total transport investment.

8.1. SURVEY RESULT & SCORE CARD FOR SUTI -8

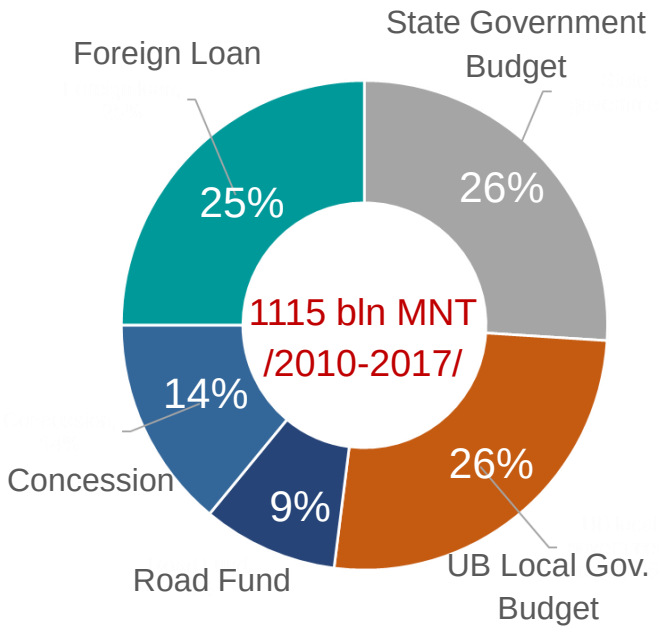
STATE & LOCAL BUDGET ROAD & TRANSPORT INVESTMENT OF CAPITAL CITY /bln. MNT/



ROAD FUND INVETSMENT BY MEASURES /mln. MNT/

Type		2013	2014	2015	2016	2017
Bridge	New construction	80.0	249.5	-	-	-
	Maintenance	591.7	-	492.6	470.0	1000.0
Road	New construction	2743.5	1280.0	2112.9	2113.6	12086.7
	Maintenance	1467.6	15613.1	12944.9	24836.0	10311.5
Road signs		960.0	1314.8	1735.9	1991.3	2479.7
Road drainage maintenance		149.9	3170.9	392.3	740.3	1000.0
Construction for road pockets for public transport bus		-	208.0	90.0	292.3	300.0
Parking		-	-	-	310.3	-
Road patch		2000.1	-	-	-	1421.5
Gravel road		47.5	-	-	-	-
Roadblocks works		811.4	-	-	-	650.5
Road pavement		1168.5	-	-	-	-
Road drainage well filter		200.0	-	-	-	-
Underpass/Underground crossing		80.0	305.1	-	-	-
Control Cameras		-	-	2015.7	-	997.4
Others		5140.6	1996.1	1375.7	1522.5	2875.6

ROAD & TRANSPORT INVESTMENT BY SOURCE



8.1. SURVEY RESULT & SCORE CARD FOR SUTI -8

SHARE OF TRANSPORT INVESTMENT SPENDING

Investment	2014	2015	2016	2017	2018	Total	Average
Public Transport Facility /mln. MNT/ from State & Local Budget	208.0	90.0	292.2	300.0	600.0	1490.2	298.0
Total Road & Transport Investment of the Capital City /mln. MNT/	146000.0	97000.0	146000.0	125740.0	134866.5	649606.5	
Total Road & Transport Investment of the Capital City /mln. MNT/ from State & Local Budget /26% of the total investment/						168897.7	33779.5
SHARE OF TRANSPORT STATE & LOCAL BUDGET INVESTMENT SPENDING							0.88

Indicator	Value	Year	Comments
Public transport quality and reliability	0.88	2018	Based on satisfaction survey on three main bus lines.
	0.88	2021	

SUTI 09

AIR QUALITY (PM10)

Assessment Of Urban Mobility: Ulaanbaatar

SCORE: Min /worst/ value: 150
Max /best/ value: 10

1. Annual mean levels of fine particulate matter (PM10) in the air (population weighed) compared to the health threshold.

9.1. SURVEY RESULT & SCORE CARD FOR SUTI -9

METHODS FOR ESTIMATING AIR QUALITY PM 10: Population weighted concentration

PM 10 INDEX: 2018

	Fuel Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	PM10 yearly
1	Misheel-ekspo tuv	144												**144**
2	Baruun durvun zam	214	177	140	95	93	69	65	66	85	126	135	155	**118**
3	1-r khoroolol	398	316	136	105	132	73	34	43	55	113	236	426	**172**
4	13-r khoroolol	189	179	136	93	105	72	42	56	81	123	180	231	**124**
5	32-yn toirog	346	216	140	120	143	93	57	73	102	158	207	284	**162**
6	Officeruudyn ordon	134	124	102	97	154	74	37	44	57	109	194	176	**108**
7	Kharkhorin zakh	228	184	139	123	154	0	0	0	92	161	244	248	**131**
8	Urgakh naran khoroolol	108	112	102	82	154	65	36	50	51	91	147	142	**95**
9	Nisekh	160	136	102	112	154	83	38	37	63	127	240	210	**122**
10	Tolgoit	240	105	34	78	83	48	11	26	60	135	191	154	**97**
11	Televiz	198	177	117	106	106	68	38	49	71	128	229	232	**127**
12	Amgalan	164	157	143	118	139	75	41	58	68	122	192	177	**121**

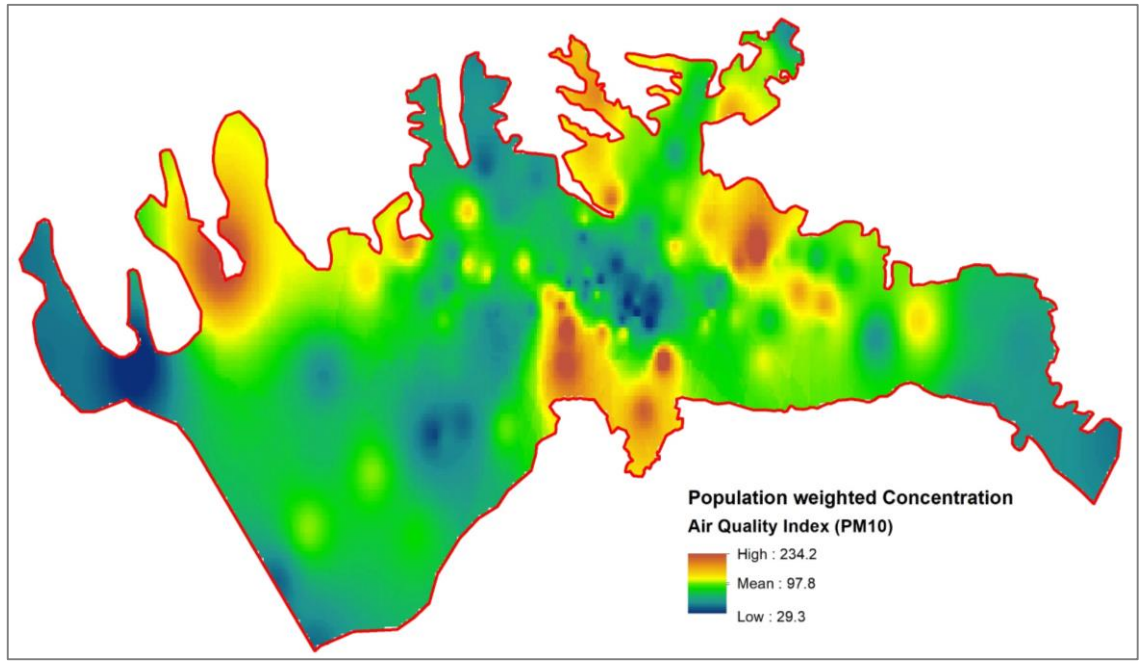
PM 10 INDEX: 2021

	Fuel Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	PM10 yearly
1	Misheel-ekspo tuv	95												**95**
2	Baruun durvun zam	134	115	106	56	53	59	76	51	20	90	123	185	**89**
3	1-r khoroolol	166	130	114	72	69	46	50	60	48	117	151	189	**101**
4	13-r khoroolol	122	104	114	64	61	51	51	44	45	103	120	172	**88**
5	32-yn toirog	177	122	109	71	71	95	96	99	82	112	138	194	**114**
6	Officeruudyn ordon	140	91	87	51	43	34	29	37	29	74	152	167	**78**
7	Kharkhorin zakh	190	135	195	100	98	73	89	87	71	117	193	172	**127**
8	Urgakh naran khoroolol	128	96	118	59	61	54	51	60	45	101	132	154	**88**
9	Khailaast	213	116	56	35	29	24	36	51	43	121	145	211	**90**
10	Nisekh	78	60	87	59	40	25	0	0	0	0	179	137	**55**
11	Tolgoit	112	62	47	26	17	10	9	17	11	0	83	205	**50**
12	Televiz	121	90	83	46	36	26	25	33	30	70	94	109	**64**
13	Amgalan	96	77	105	55	51	42	0	0	0	0	0	143	**47**
14	Bayankhoshuu	0	148	141	137	115	0	0	0	0	267	253	288	**112**

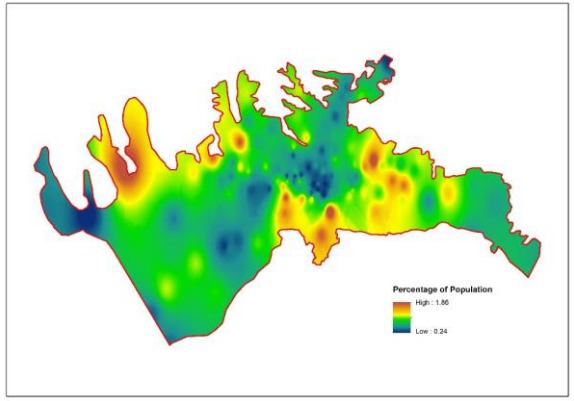
1) Estimate yearly PM10 Index at each station.
2) Estimate population percentage in each horoo area /the smallest administration unit of UB city/.
3) Evaluate the interpolation at ArcGIS and create a PM 10 interpolation raster map.
4) Evaluate the interpolation of population percentage data from horoo center and produce a population interpolation map.
5) Multiply PM10 index and population maps and get result of the population weighted

9.1. SURVEY RESULT & SCORE CARD FOR SUTI -9

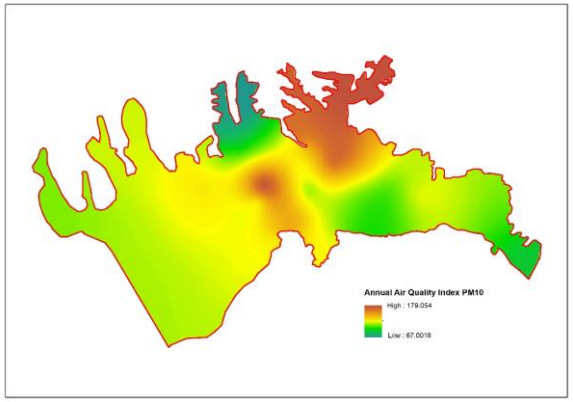
AIR QUALITY (PM 10)



Percentage of Population



Annual Air Quality Index (PM10)



Indicator	Value	Year	Comments
Air quality (PM10)	97.8	2018	Data for monitoring stations managed by National Agency Metrology and the Environmental Monitoring. The values are averaged by estimate of population exposed per city area.
	69.7	2021	

SUT 10 I

GREENHOUSE GAS EMISSIONS (CO2 eq tons/year)

Assessment Of Urban Mobility: Ulaanbaatar

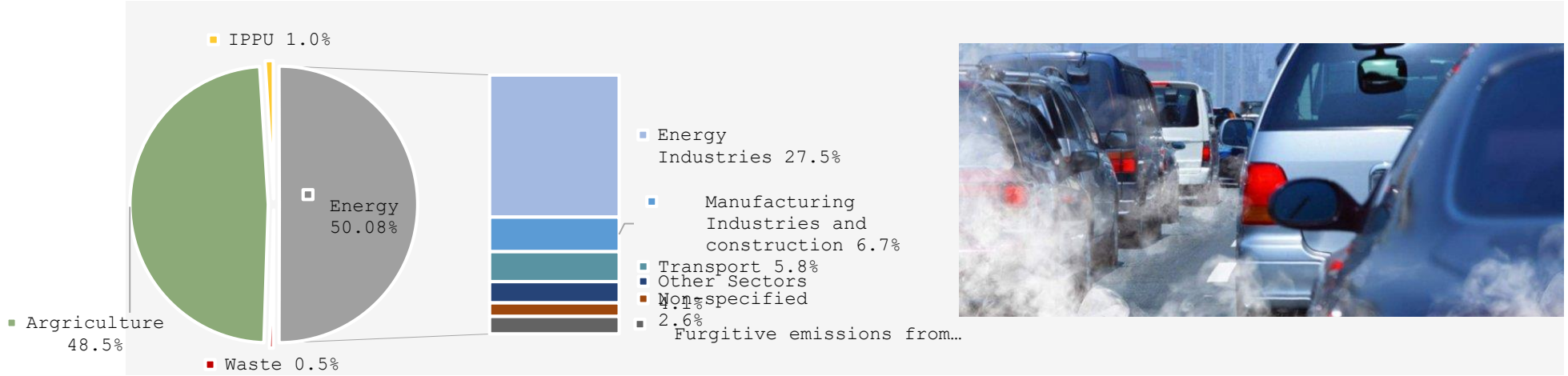
SCORE: Min /worst/ value: 2.5%
Max /best/ value: 0%

1. CO2 equivalent emission from transport by urban residents per annum per capita.

10.1. SURVEY RESULT & SCORE CARD FOR SUTI -9

GHG EMISSIONS FROM THE ENERGY SECTOR BY SOURCE CATEGORIES, GG CO2E

Categories	Emissions	1990	1995	2000	2005	2010	2014
Energy Industries	Gg	5,209.46	5,374.38	5,126.45	6,201.15	7,110.12	9,474.70
	%	46.97%	60.25%	68.09%	63.68%	53.75%	54.87%
Manufacturing Industries & Construction	Gg	2,535.38	1,792.04	571.47	716.3	1,888.93	2,313.48
	%	22.86%	20.09%	7.59%	7.36%	14.28%	13.40%
Transport	Gg	1,439.66	771.75	935.12	1,108.73	1,400.58	1,997.25
	%	12.98%	8.65%	12.42%	11.39%	10.59%	11.57%
Other sectors	Gg	1,164.36	468.85	646.36	1,221.03	1,690.48	1,422.37
	%	10.50%	5.26%	8.59%	12.54%	12.78%	8.24%
Non-specified	Gg	611.38	421.83	148.07	333.48	456.93	903.37
	%	5.51%	4.73%	1.97%	3.42%	3.45%	5.23%
Fugitive emissions from fuels (coal, oil)	Gg	130.91	91.8	101.42	157.6	680.31	1,156.62
	%	1.18%	1.03%	1.35%	1.62%	5.14%	6.70%
Energy Total	Gg	11,091.15	8,920.65	7,528.89	9,738.29	13,227.35	17,267.79
	%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%



10.1. SURVEY RESULT & SCORE CARD FOR SUTI -9

ESTIMATING FUEL & DIESEL CONSUMPTION

Fuel Type	Indicators	Vehicle Types				Total
		Passenger cars	Trucks	Buses	Special Purposed	
Fuel	Number of vehicles	163647	5463	1923	392	171425
	Fuel consumption per year, tonnes	1.8	2.1	3.6	1.2	
	Total Fuel Consumption, tonnes	294564.6	11472.3	6922.8	470.4	313430.1
Diesel	Number of vehicles	17993	69237	8098	5938	101266
	Diesel consumption per year, tonnes	2.2	2.5	3.6	1.8	
	Total Diesel Consumption, tonnes	39584.6	173092.5	29152.8	10688.4	252518.3
Dual fuel engine	Number of vehicles	114656	232	101	15	115004
	Fuel consumption per year, tonnes	0.7	1.2	3.0	0.7	
	Total Fuel Consumption, tonnes	80259.2	278.4	303	10.5	80851.1
Gas	Number of vehicles	13516	324	179	11	14030
Total fuel consumption, tonnes						394281.2
Total diesel consumption, tonnes						252518.3

TOP DOWN CALCULATION BASED ON ESTIMATION OF FUEL CONSUMPTION

Fuel type	Consumption, tonnes	CO2-factor kg/l	Emissions tons/year	Population	Emission per capita
Gasoline/Petrol	394281.2	2.272	895,609.75		
Diesel	252518.3	2.676	675,738.97		
TOTAL			**1,571,348.72**	**1347598**	1.17

Indicator	Value	Year	Comments
Public transport quality and reliability	1.17	2018	Based on estimate of fuel consumption by types of vehicles and average national emission factors per traffic mode.
	1.17	2021	

SUT

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10

SUMMARY & RESULT

Assessment Of Urban Mobility: Ulaanbaatar

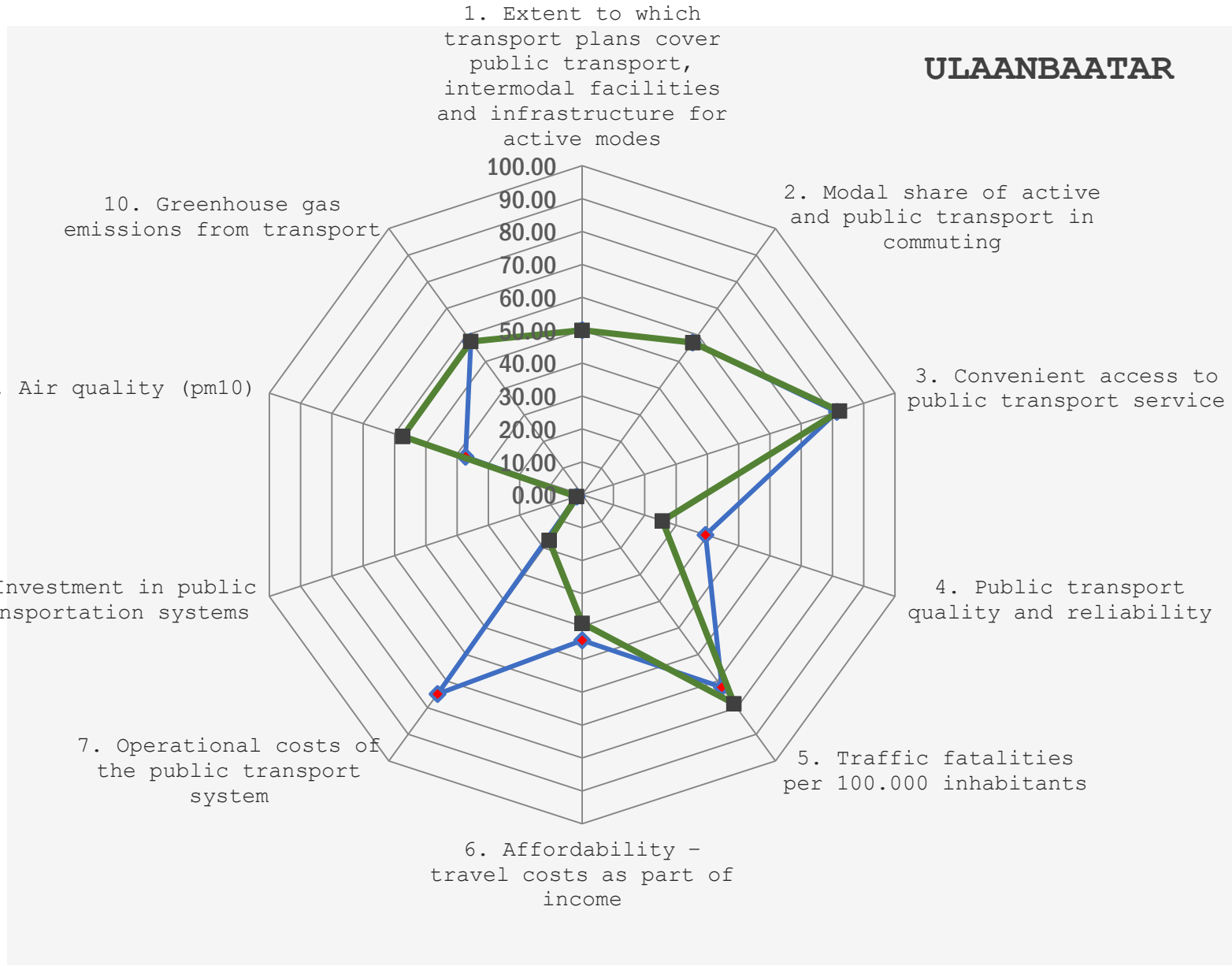
SCORE: Min /worst/ value: 2.5%
Max /best/ value: 0%

1. CO2 equivalent emission from transport by urban residents per annum per capita.

SURVEY RESULT **2018 & 2021**

№	Indicators	Natural Units	2018						2021					
			Weight	Min	Max	UB Value	Normalization	Year	Weight	Min	Max	UB Value	Normalization	Year
1	Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes	0-16 scale	0.1	0	16	**8.00**	**50.00**	2018	0.1	0	16	**8.00**	**50.00**	2021
2	Modal share of active and public transport in commuting	% of trips/mode	0.1	10	90	**55.7**	**57.16**	2017	0.1	10	90	**54.6**	**54.60**	2017
3	Convenient access to public transport service	% of population	0.1	20	100	**85.14**	**81.42**	2018	0.1	20	100	**85.82**	**82.28**	2021
4	Public transport quality and reliability	% satisfied	0.1	30	95	**55.65**	**39.46**	2018	0.1	30	95	**46.66**	**25.63**	2021
5	Traffic fatalities per 100000 inhibitions	No. of fatalities	0.1	35	0	**9.70**	**72.31**	2018	0.1	35	0	**7.54**	**78.47**	2021
6	Affordability-travel costs as part of income	% of come	0.1	35	3.5	**21.10**	**44.25**	2018	0.1	35	3.5	**22.7**	**39.5**	2021
7	Operational costs of the public transport systems	Cost recovery ratio	0.1	22	100	**80.38**	**74.85**	2018	0.1	22	100	**35.35**	**17.11**	2020
8	Investment in public transtation systems	% of total investment	0.1	0	50	**0.88**	**1.76**	2018	0.1	0	50	**0.88**	**1.76**	2021
9	Air quality (PM10)	µ/m3	0.1	150	10	**97.80**	**37.29**	2018	0.1	150	10	**69.70**	**57.36**	2021
10	Greenhouse gas emissions from transport	tons/Capita/year	0.1	2.75	0	**1.28**	**57.60**	2018	0.1	2.75	0	**1.17**	**57.60**	2021

SURVEY RESULT 2018 & 2021



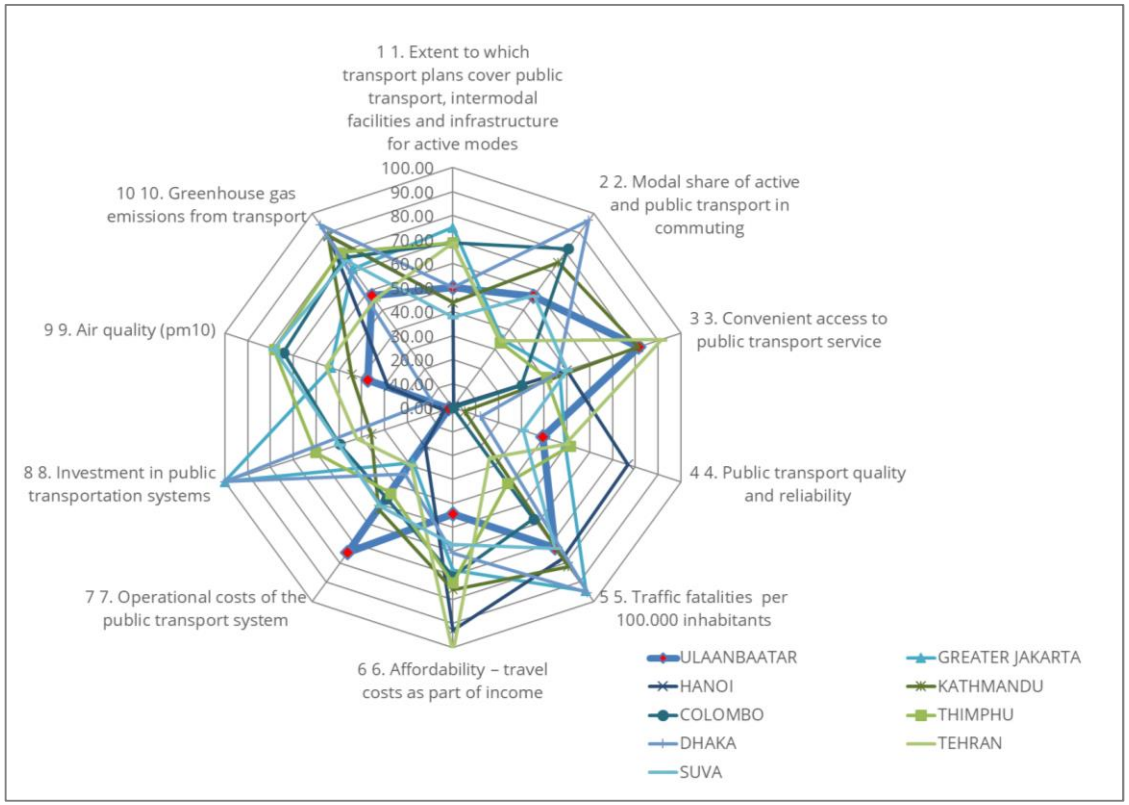
C1 RESULT SPIDER DIAGRAM

№	Indicators	Normalization	
		2018	2021
1	Extent to which transport plans cover public transport, intermodal facilities and infrastructure for active modes	**50.0**	**50.00**
2	Modal share of active and public transport in commuting	**57.16**	**54.60**
3	Convenient access to public transport service	**81.42**	**82.28**
4	Public transport quality and reliability	**39.46**	**25.63**
5	Traffic fatalities per 100000 inhibitions	**72.31**	**78.47**
6	Affordability-travel costs as part of income	**44.25**	**39.5**
7	Operational costs of the public transport systems	**74.85**	**17.11**
	Investment in public		

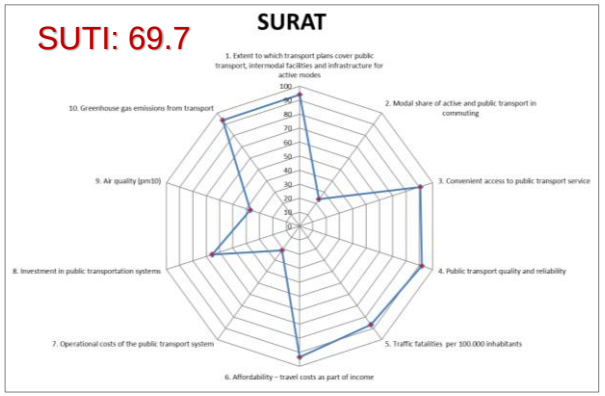
03.

SUTI: ASIAN CITIES

UB SUTI: 39.09



SUTI: 69.7



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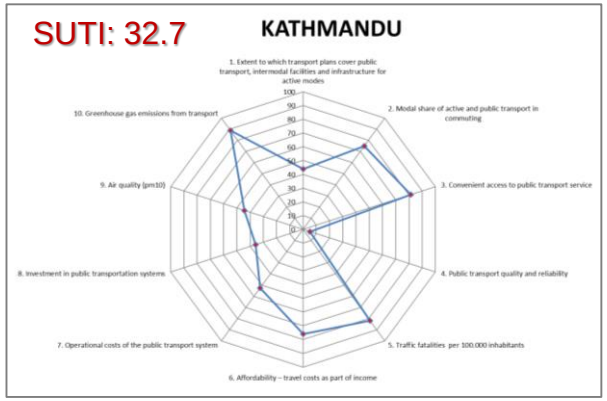

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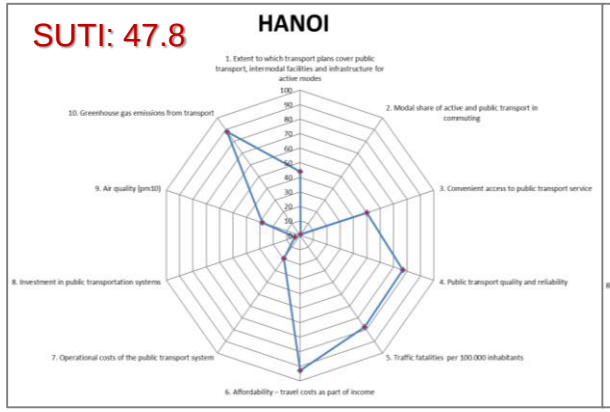

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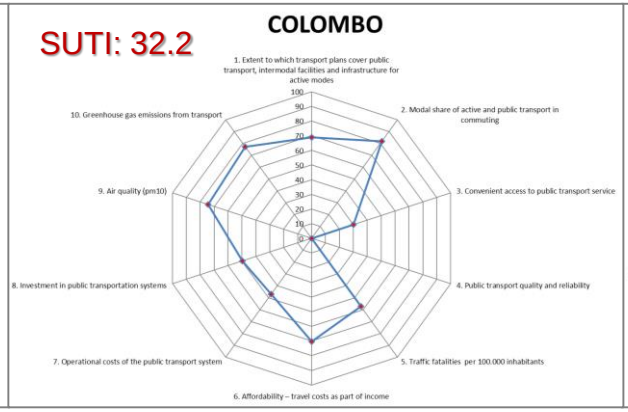

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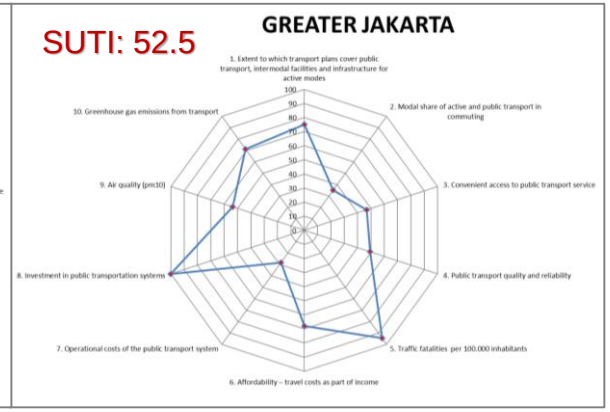

04.

CONCLUSIONS & RECOMMENDATIONS

CONCLUSIONS & RECOMMENDATION

1
- Need UB urban transport master plan
- Less politics.
- Improve monitoring of implementing.

2
- Support active transport mode.
- Support public transport.
- Need limitation of passenger cars.

3
- Accessibility of public transport is. Good.
- Lower overlaps of the public transport route.
- Some main stations needed to be transfer hub stations.

4
- Need improvement for public transport quality & reliability.
- Safety is the most concerned issue.
- Punctuality is important to improve services.
- Maintain the National Road Safety Program

5
- Need more education for road and transport safety.
- Need to prohibit the vehicles with right hand wheeler.
- Personnel courtesy and safety of drivers are needed to

6
- Compared to CPI, the public transport fare is low.

7
- 35.67 percent of the operation cost is covered by the fare revenue. In order to have better quality & reliable services, the government needs to do promoted actions to entities engaged with public transport serves.

8
- INVESTMENT FOR PUBLIC TRANSPORTATION IS NEEDED.

9
- Because of a dramatic increase of number of vehicles, unpaved road, increasing number of vehicles with diesel engine, TRAFFIC CONGESTION and other road & transport related issues are creating air pollution and greenhouse gas emission. Need government actions to protect the citizens of Ulaanbaatar from environmental pollutions including air pollution, greenhouse gas emission and soil pollution.

10


THANK YOU